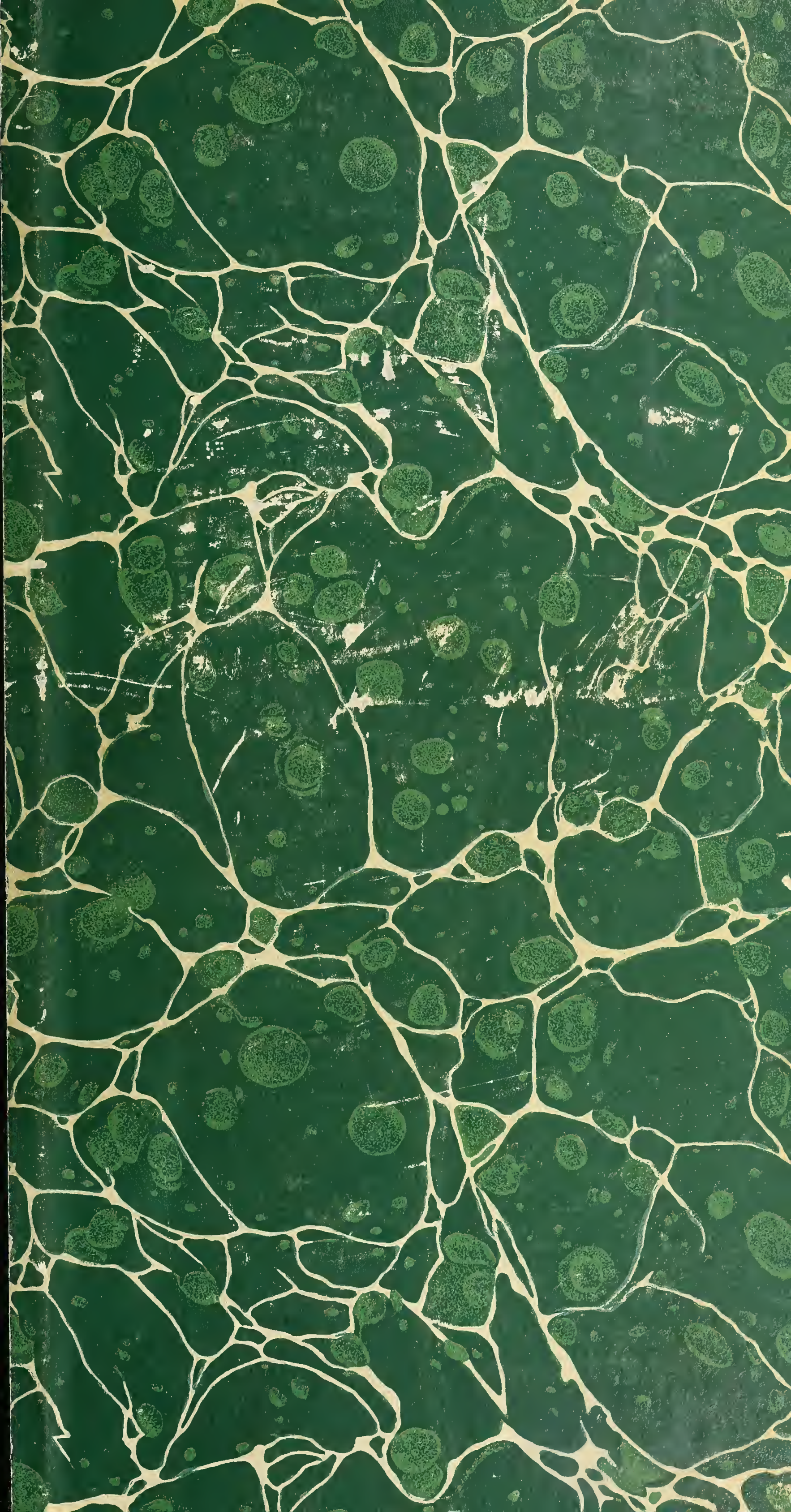

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OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXXIV 1939

1872

EDITED BY
J. R. de la TORRE-BUENO

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G. P. ENGELHARDT CARL GEO. SIEPMANN

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J. R. de la TORRE-BUENO, Editor
CARL GEO. SIEPMANN GEO. P. ENGELHARDT

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§ Insects

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXXIV February, 1939 No. 1

THE DISTRIBUTION OF THE GENUS NOTONECTA IN MEXICO.

By H. D. Thomas, Univ. of Kansas, Lawrence, Kan.

Mexico, a small country with a great variety of ecological situations, has long provided students of biology with interesting material for thought. It was during the summer of 1936, accompanied by Doctor Hobart M. Smith, that I made my first entomological collecting trip to this country and gathered specimens from eleven Mexican states. Again, in the summer of 1937, I made a second venture which carried me into five additional states and rewarded me with some ten thousand specimens of aquatic hemiptera.

As a result of my association with Doctor H. B. Hungerford at the University of Kansas I had acquired an interest in the water bugs. This together with my first collecting trip aroused my curiosity as to the matter of their geographical distribution. Study of the series of *Notonecta* taken on these trips as well as of material from Mexico deposited in the collections at Lawrence together with a survey of the topography of Mexico suggests a possible explanation of the distribution of some of the groups within this genus. In this paper I shall discuss the distribution of four groups, referred to as the *mexicana, shooteri, undulata,* and *unifasciata* groups.

The *mexicana* and *shooteri* groups are composed of individuals decidedly larger and more robust than those of the *unifasciata* and *undulata* groups. In coloration they tend to develop patterns of red, grey, tan, black, and white, whereas those of the *unifasciata* and *undulata* groups are restricted to black and white with a tiny bit of orange in a few cases. The groups are also differentiated by sharp morphological characters which I need not discuss, as Hungerford has given a rather complete and detailed description of them in his monograph "The Genus Notonecta of the World."

Members of the *mexicana* group were collected in a great many

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places both by myself and numerous other collectors working in Mexico in the past. Text figure 1 illustrates the distribution of this group as known to date.

Members of the *shooteri* group have been taken in various localities as indicated by text figure 2.

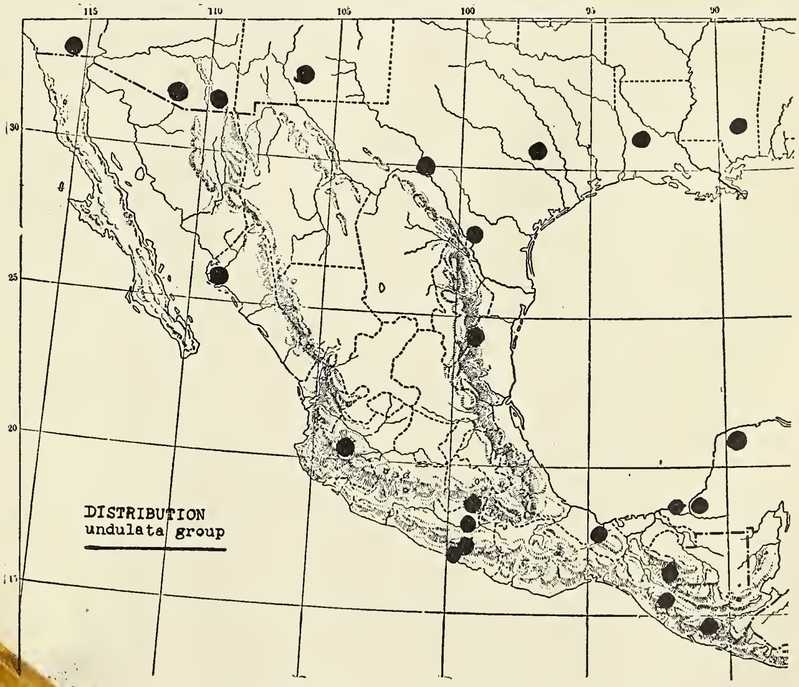
Members of the *undulata* group have been taken in various localities as indicated in text figure 3.

Members of the *unifasciata* have been taken in various localities as indicated in text figure 4.

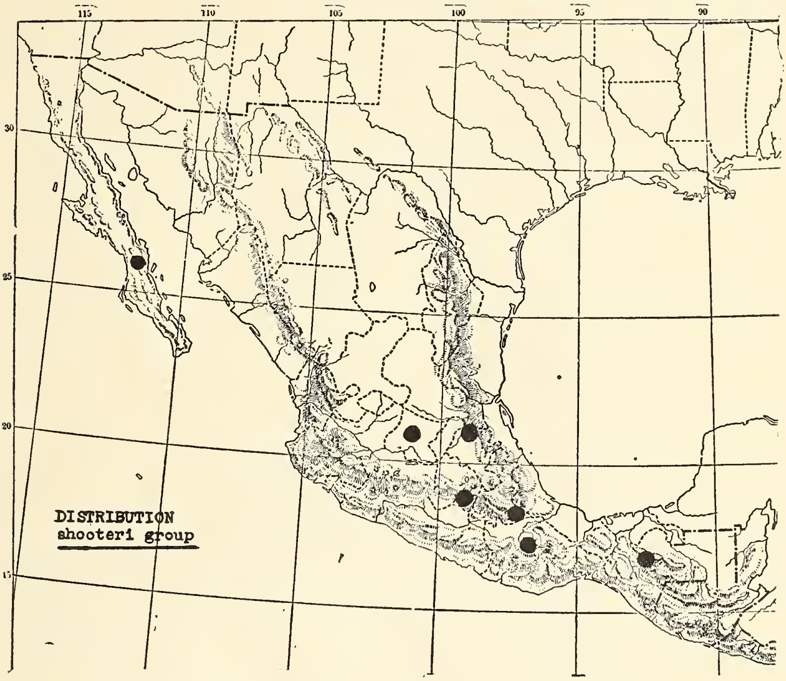
Carlos Hoffman has divided Mexico into three faunal regions as shown in text figure 5. When one compares the distribution of the various groups with these regions as set forth by Hoffman it is immediately apparent that the *mexicana* and *shooteri* groups are restricted to the Region of the North and the Pacific Region, whereas the *undulata* and *unifasciata* groups are to be found in all regions.

As Hungerford points out the probability is that the subgenus *Paranecta* is the oldest of the various subgenera of the Notonecta. It is widely distributed in the Western Hemisphere, having 15

Text Figure 1.



TEXT FIGURE 2.

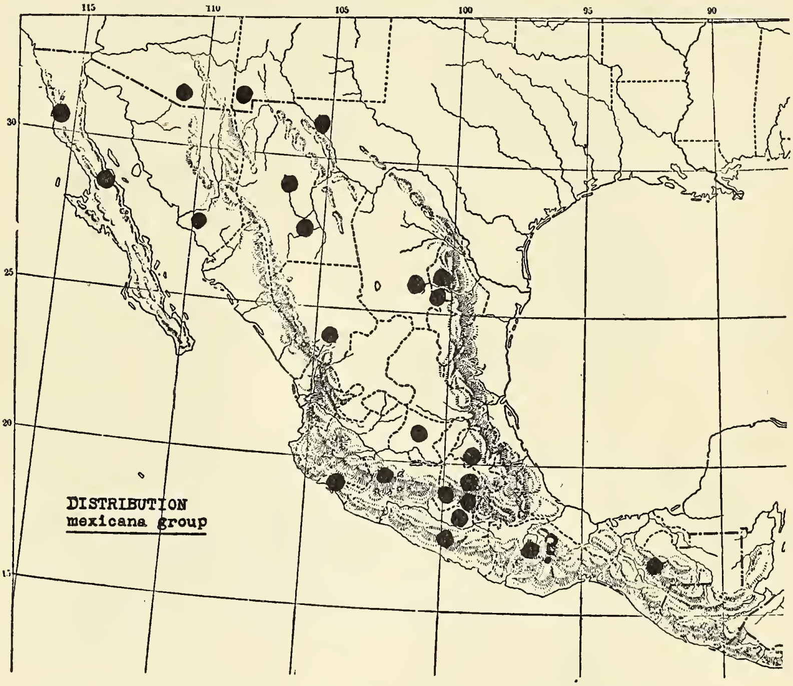


species in South America and 13 species covering Central America, North America, and Insular America. This points to the probability of *Notonecta indica* and *Notonecta unifasciata,* members of this subgenus, having had more time at their disposal in which to migrate and adapt themselves to new and different environments, than has been the lot of the various species of the *mexicana* and *shooteri* groups which are of more recent origin.

In view of this I suggest that the present area of distribution reflects the longer period of existence of *N. indica* and *N. unifasciata* which has enabled them to adapt themselves to many environments, among them that of Hoffman's "Región del Golfo." I further suggest that the more recent origin of the *mexicana* and *shooteri* groups has not as yet made it possible for the various species to adapt themselves to the conditions obtaining in the Gulf Region.

This, then, brings up two questions: (1) Where have the *mexicana* and *shooteri* groups originated? and (2) What are the present day conditions to which they have not as yet adapted themselves It is widely distributed in the Western Hemisphere, having 15 and which consequently act as present barriers or limits of their dispersal. In answer to these questions I submit the following:

TEXT FIGURE 3.

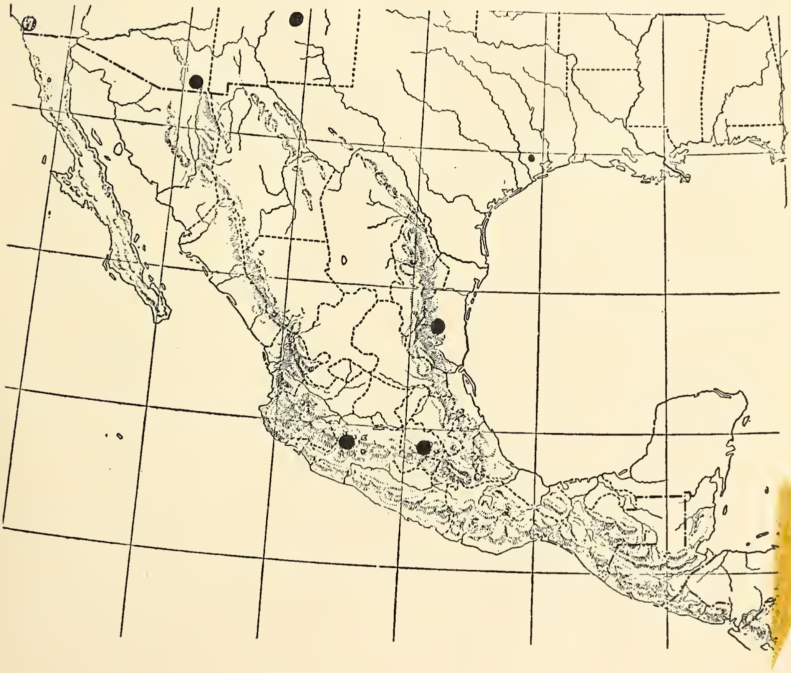


It is my opinion that both the *mexicana* and *shooteri* groups have developed as a result of ancestral stock encountering a veritable region of plenty within the southern portions of the Mexican plateau. The topography here is such as to provide excellent breeding grounds. The climate throughout the year is fairly mild, and food, which in the case of Notonecta takes the form of a host of tiny crustaceans referred to collectively as the Entomostraca, is extremely abundant. These conditions would afford ample opportunity for the great development and species formation exhibited by the *mexicana* and *shooteri* groups. I further suggest that the various species of these two groups are still restricted to these regions by reason of their having not as yet adapted themselves to the less favorable habitats afforded by the topography of other regions, topography which among other things fails to provide so abundant a supply of food, or so mild a climate.

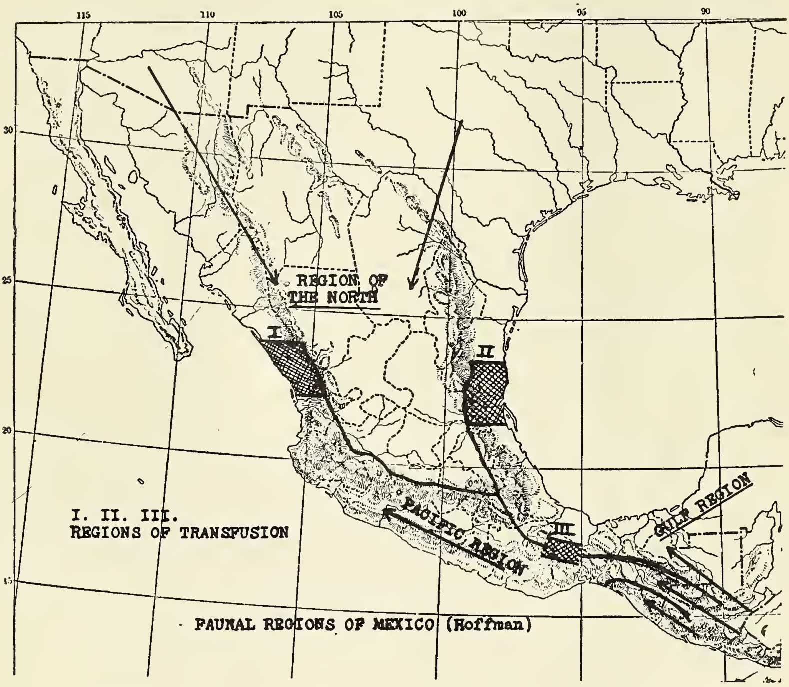
If one will examine the topography of the three regions as designated by Hoffman he will note the following: The Region of the North and the Pacific Region are almost entirely mountain districts or high plateau country in which we find an abundance of pools, ponds, and lakes of all sizes. This, however, is not the case when we come to consider the Gulf Region. For the most part the latter is low coastal and low inland territory characterized not by ponds and lakes but by a network of streams through which rushes all the drainage from the eastern plateau region, traveling at great speed during the rainy season and carrying everything before it at times. This region includes most of the states of Vera Cruz, Tabasco, Campeche, and a portion of Tamaulipas as well as Yucatan.

It is a fairly well accepted fact that the Entomostraca make up the principal bulk of the food of Notonecta. In his paper, "The Biology and Ecology of Aquatic and Semiaquatic Hemiptera," which appeared in the Kansas University Science Bulletin for December, 1919, Hungerford writes: ". . . the intimate ecological connection of these insects (the Notonectidae) with the life of the pool lies in the fact that a large part of the food of the young of all of them, and the adults of *Buenoa* and *Plea,* consists of Ostracods and other small Entomostraca." My experience in collecting in the Region of the North and the Pacific Region has shown me that there the

TEXT FIGURE 4.



TEXT FIGURE 5.


115
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15
REGION OF THE NORTH
I
II
III
I. II. III. REGIONS OF TRANSFUSION
PACIFIC REGION
GULF REGION
FAUNAL REGIONS OF MEXICO (Hoffman)

Entomostraca attain a great development. Many of the lakes and ponds are literally alive with swarming Cladocera, Copepoda, Ostracoda, etc. This is not true of the Gulf Region, however. As a general rule I have found the fauna of Entomostraca there extremely poor. The fast-moving streams there seem quite unfavorable to their development.

This distribution of the Entomostraca throughout the three regions is what might be suspected in view of what limnologists have to say concerning the habitats of some members of this group. For example, Ward and Whipple state in their book "Fresh Water Biology," "The Cladocera are found in all sorts of fresh waters. Lakes and ponds contain a much larger number of forms than do rivers. The shallow, weedy backwaters of a lake whose level is fairly permanent, harbor a greater variety of species than does any other kind of locality." Concerning Copepoda they write: "Hardly any body of water is without its copepod population, although running waters have a less abundant population than lakes."

With such a distribution of food it is not surprising that only a few species of the genus Notonecta have been taken in the Gulf

Region. With the exception of *Notonecta unifasciata* of which I have taken two specimens in the extreme eastern portion of San Luis Potosi, *Notonecta indica* is the only member of this genus to have established itself within the Gulf Region. As will be recalled, *N. indica* is a member of the Paranecta, the oldest subgenus of Notonecta.

The concept of a group of animals being limited in their distribution by the distribution of their food is not at all a new one. Among biologists it is a fairly well-accepted fact that *stenophagy* (the eating of a few or even only one kind of food) tends to limit distribution of animals. In their book "Ecological Animal Geography" Hesse, Allee, and Schmidt state, "The bird called the nutcracker in Siberia is limited to the occurrence of the nut pine, while the omnivorous raven ranges almost from pole to equator. The distribution of the green sea urchin coincides with that of the hydroids which constitute its food. The Euphorbia sphinx would have a much wider distribution if its caterpillar were not strictly limited to a single genus of plants; it was unknown at Göttingen until *Euphorbia* was planted in the Botanical Garden, when it appeared at once."

I therefore suggest that the explanation of the distribution of Notonecta in Mexico lies partly in the topography of the country which governs to a large extent the distribution of their food. By providing many ponds, lakes, and other permanent and semipermanent bodies of non-running water in which the Entomostraca develop in large numbers the topography of the Region of the North and the Pacific Region creates an excellent habitat for the development of Notonecta. The almost superabundance of food in some of the localities I have visited in these regions suggests to my mind a condition very favorable to the development of the large and robust bodies of the members of the *mexicana* and *shooteri* groups. It also appears that the scarceness of food in the Gulf Region, which is again a function of the topography, excludes all save a few stragglers from the *undulata* group which may possibly have become less stenophagous or adapted themselves to a lower food requirement during their relatively longer period of existence. That a group of animals can adapt itself physiologically to a lower food supply than that which is utilized by its close relatives is evidenced by the fact that the Chinese, a race dwelling in a land where food is scarce, exhibit a basal metabolic rate which averages ten per cent below that of Europeans, Americans, and negroes. (American Journal of Physiology, 73, 449, 1925; Proc. Nat. Acad. Sci., 11, 342, 1926).

At present it appears that the *mexicana* and *shooteri* groups are limited by thermal factors so far as their northward dispersal is concerned. This is suggested by their northernmost habitats coinciding approximately with the southernmost points reached by the severe blizzards and general frigid weather within the United States. I refer to such localities as Cochise County, Arizona; Las Cruces, New Mexico; San Diego, California; and Valentine County, Texas.

In conclusion I suggest that the present direction of dispersal of these two groups is to the south, as a spread in this direction would involve neither of the two barriers I have mentioned, *i.e.,* food in the East and temperature in the North. By following the plateau country of Central America these species might continue to encounter suitable breeding grounds. This suggestion is substantiated somewhat by the record of two species of the *shooteri* group and one species of the *mexicana group* from Bogotá, Colombia, and of a species of the *mexicana* group from Costa Rica together with a subspecies of this same species recorded from El Salvador. With the exception of a not yet confirmed report of a member of the *mexicana* group (personal communication from the collector) at Hacienda La Libertad on the boundary of Guatemala and Mexico these constitute the only known records of these groups having been taken south of the state of Chiapas, Mexico.

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THE OCCURRENCE OF HEMIARGUS ISOLA (REAKIRT) IN NORTHERN OHIO.

G. W. Rawson, Detroit, Michigan,
and
John S. Thomas, Columbus, Ohio.

The occurrence of insects in territory out of their usual range is an experience met with by practically all field entomologists. However, the occurrence of "Reakirt's Blue," *Hemiargus isola* (Reakirt) in Northern Ohio is not only a new state record, but is so unusual that we thought the facts worthy of recording.

Hemiargus isola, according to Dr. John A. Comstock in his Butterflies of California, occupies a wide territory, extending from Southern California eastward to Illinois and south to Texas.

On Saturday, July 25, 1937, a party consisting of Mr. Edward S. Thomas and Mr. John S. Thomas, of the Ohio State Museum, Mr. Joseph Enke of Columbus and G. W. Rawson and Mr. Albert Bender of Detroit, met in what are called "The Oak Openings," near the village of Holland (Lucas County), Ohio, about seven miles west of the city of Toledo. The principal object of our search was "Scudder's Blue," *Plebeius scudderi* (Edwards), a few of which had been taken the previous year in this locality.

Shortly after commencing the search for this species, John Thomas took an unfamiliar lycaenid that was later identified as *Hemiargus isola.* Naturally, the taking of something so unusual caused great excitement and intensified our search for more specimens. About half an hour later John Thomas took another specimen of *isola,* not far away from where the first had been captured.

The next day, the party continued the search in the sand pit, with the result that the senior writer (G. W. R.) had the good fortune to secure a third specimen of *isola* near the same area in the sand pit where the other two specimens had been found the previous day. Further search was terminated soon after by heavy and continuous rain that lasted all day.

The "Oak Openings" region is an area of fossil sand dunes at the western boundary of post-glacial Lake Warren. The "Sand Pit" is a depression caused by the excavation of sand, made years ago for a railroad fill, resulting in the rejuvenation of the ancient dune. There is now a large area of raw, shifting sands, with a wealth of unusual dune plants. The specimens of *isola* were in an area of raw sand, sparsely vegetated with scrubby, dry soil willows and other sand plants.

The entire Oak Openings region is noteworthy for the abundance of plants characteristic of our western prairies and sand areas. Mr. Edward Thomas has found in the area a number of species of Orthoptera and other insects which are not known to occur elsewhere in Ohio, all of which are of western or northwestern origin. It is the only known Ohio station for such butterflies as *Incisalia irus* (Godart), *Plebeius scudderi* (Edwards), *Heodes helloides* (Boisduval) and *Strymon edwardsi* (Saunders). Specimens of the foregoing species, collected by John Thomas, Edward Thomas and Charles F. Walker are in the collection of the Ohio State Museum. Two of the specimens of *isola* are in the same institution; the third is in the collection of the senior writer.

The fact that three specimens of *isola* were taken in the same area would indicate that these were not merely strays, but had actually been bred in the neighborhood.

The writers hope to search this area again next year with the object of determining whether *isola* shall have been able to withstand the winter of Northern Ohio.

As very little seems to be known about the limits of the range of *Hemiargus isola,* it would be interesting to hear from other collectors who may have found this species in states other than those in which it is generally supposed to occur.

Hister purpurascens Recorded from North America (Coleoptera, Histeridae).—*Hister* (*Paralister*) *purpurascens* Herbst. is a common species throughout Europe, where it occurs on excrement. I record it from North America on the basis of a single specimen taken by Mr. Klages at Pittsburgh, Pa. While the species may not be established in the United States, collectors should be on the lookout for it.

H. purpurascens belongs to the *foedatus* group of *Hister* as defined by Horn (Subgenus *Paralister* Bickh.). The specimen from Pittsburgh has a large indefinite reddish spot covering most of the elytra, somewhat suggesting an immature specimen, and this is the usual color of this species in Europe. Entirely black specimens also occur, but they are not common. I have examined a large series of this species from Europe, with which the Pittsburgh specimen agrees in color and structural details. The most obvious character distinguishing this species is its color. Additional characters for the separation of this species from its allies will be given in a paper on the *foedatus* group of *Hister* which is in preparation. —Carl G. Siepmann, Rahway, N. J.

NEW SPECIES OF BEES OF THE GENUS DIADASIA FROM CALIFORNIA (HYMENOPTERA, APOIDEA).

By P. H. Timberlake,
Riverside, California.

The types of the following new species and subspecies of *Diadasia* are in the collection of the Citrus Experiment Station, Riverside, California.

Diadasia consociata n. sp.

Allied to *D. nitidifrons* Ckll., but differs in being smaller and in having the basal area of propodeum polished, the hair of abdomen shorter and much more depressed. From *D. diminuta* (Cress.) it differs in having black hair at base of tergites in both sexes.

> Male.— Black, the tarsi and apex of tibiae dark ferruginous, the spurs a little paler. Flagellum more or less reddish beneath. Tegulae slightly rufescent. Wings dusky hyaline, the venation almost black. Head much broader than long, the inner orbits diverging above. Third antennal joint a little shorter than 4 + 5. Middle joints of flagellum as long as wide. Clypeus and face finely, closely punctured. Nude upper part of frons and vertex polished, nearly impunctate, except middle of vertex behind the ocelli. Mesoscutum, scutellum and pleura only slightly more sparsely punctured than clypeus. Basal area of propodeum polished. Middle and hind femora and tibiae moderately incrassate. Hind tibiae with a small rounded lobe at apex beneath over insertion of spurs. Apical teeth of seventh tergite slender, spine-like, rather widely separated. Pubescence ochraceous, becoming whitish on face, on under parts and on legs, dense on face, pleura, outer side of tibiae and basitarsi, and shorter and thinner on mesonotum. Area between upper ends of eyes almost nude. Hair on inner side of hind tarsi ferruginous. Hair of abdomen subdepressed, rather dense, longer and erect on tergite 1 except at apex. Hair of disk of tergites 2 to 7 black, that at apex of 1 to 6 denser, pale ochraceous or whitish, forming a rather narrow band, somewhat broadened on middle of 2. Hair of venter light, except on segments 3 to 5, where it is fuscous, but leaving a pale apical fringe. Apex of ventrite 6 with a short dense tuft of fuscous hair, emarginate in front, or almost divided into

two tufts, the segment normally retracted so that only the hairy part is exposed by a broad rounded emargination of apical margin of preceding segment. Length, 6–8 mm.; anterior wing, 4.8–5.7 mm.

Female.—Similar to male. Antennae a little shorter, the middle joints of flagellum broader than long. Clypeus dullish, finely roughened, finely, obscurely and closely punctured, with some large punctures interspersed. Mesopleura slightly more coarsely and more sparsely punctured than mesoscutum. Pubescence more ochraceous. Hair of posterior two-thirds of mesoscutum short, appressed, rather thin and well exposing the surface. Hair of scutellum similar, but longer, dense and erect on each side. Hair of abdomen appressed, except at base of tergite 1, that on basal half of tergites 2 to 5, apical margins of 5 and on sides of 6, black. Apical band on tergites 1 to 4 pale ochraceous or whitish, broad, sharply defined anteriorly and somewhat broadened in middle on 2 to 4. Tergite 5 with light hair except at base and apex. Hair of venter mainly black and thin, but denser on two penultimate segments. Hair of legs mainly pale ochraceous, that on inner side of middle and hind basitarsi black, of front basitarsi reddish. Scopa of hind legs and hair on under side of front femora moderately dense. Length, 6.5–8 mm.; anterior wing, 5–6 mm.

Holotype male and allotype, Blythe, California, at flowers of *Lippia nodiflora,* July 15, 1938 (Timberlake). Also the following paratypes: 3 males, 54 females, taken with the types, July 15 and 16; 1 male, Blythe, Nov. 2, 1936 (C. M. Dammers); 13 females, Blythe, on *Sphaeralcea emoryi,* Nov. 22, 1936 (Timberlake); 30 males, 9 females, Blythe, at nests in ground, July 15, 1938 (Dammers); 3 males, 15 females, Blythe, Aug. 13, 1938 (G. P. Engelhardt), in U. S. National Museum; 2 males, La Posta, San Diego County, June 18, 1938 (Dammers); 1 male, near Strathmore, Tulare County, on *Centromadia pungens,* Sept. 30, 1935 (Timberlake); 1 male, Temecula, Riverside County, on *Heliotropium curassavicum,* Sept. 9, 1938 (Timberlake); 4 males, 10 females, East Whittier, Los Angeles County, on *Frankenia grandifolia,* Aug. 4, 1929 (Timberlake) and 1 female, Indian school, Pyramid Lake, Nevada, July, 1911 (J. M. Aldrich).

The following variations have been noted: The abdominal bands of the female may be narrower and even, but this is apparently due to wear. The mandibles are often reddish at the middle. Sometimes the legs and abdomen are more or less, or entirely, ferruginous in females from the type locality and the venter is more or less suffused with this color even in darker specimens. Specimens from the cismontane area have the basal area of propodeum delicately tessellate but shiny, the tegulae paler, and no black hair at base of tergite 2 in the male.

Diadasia tuberculifrons n. sp.

Allied to *D. sphaeralcearum* Ckll., but easily distinguished by the larger size and the two shining rounded bosses on the frons.

Male.—Black, the tarsi rufescent, except claw joint. Mandibles reddish at middle. Apical margin of tergites 1 to 6 moderately broadly whitish hyaline. Spurs pale ferruginous. Tegulae ferruginous, with a fuscous spot at base anteriorly. Wings somewhat dusky, the veins dark, slightly tinged with reddish. Stigma, except margins, and costal vein especially toward the base, ferruginous. Head much broader than long, the inner orbits strongly divergent above. Frons with a large rounded boss on each side of middle, just in front of ocelli. Third antennal joint shorter than 4 + 5. Middle joints of flagellum hardly longer than wide. Clypeus and face finely, closely punctured. Nude part of frons and vertex polished, almost impunctate, but the thinly hairy area behind ocelli minutely punctured. Mesoscutum and scutellum shining, minutely punctured, the punctures well separated. Mesopleura slightly more strongly punctured than scutum. Basal area of propodeum polished. Middle and hind femora and tibiae moderately incrassate. Hind tibiae without a projecting lobe at apex beneath. Apical teeth of tergite 7 small, almost as long as wide, with a round sinus between them. (In Arizona paratype these teeth are coarser and closer together.) Pubescence ochraceous, whiter beneath and on legs, dense on face and abdomen. Area between upper ends of eyes nude. Hair of mesonotum, except anteriorly, and of middle and hind legs, except tibiae and basitarsi, thin. Hair of tergites appressed, no denser at the apices, but the whitened integument imparts a band-like appearance. Hair of first tergite, except on apical margin, longer and erect, as to a less degree it is also on lateral margins of following segments. Hair of venter subappressed, becoming dense on apical part of ventrite 5. Ventrite 6 with short erect pile at apex and base, that at base becoming longer on each side to form a dense tuft. Hair on inner side of front and hind basitarsi ferruginous. Length, 6.75–8 mm.; anterior wing, 6–6.5 mm.

Female.—Similar to the male. Flagellum slightly rufescent beneath, the middle joints much broader than long. Third antennal joint equalling 4 + 5. Clypeus with a few coarser punctures interspersed. Scutellum and anterior third of mesoscutum rather closely punctured. Pubescence brighter ochraceous, especially on mesonotum and abdomen. Hair of face below antennae subappressed, soon wearing away on clypeus. Hair of scutellum and of anterior third and margins of mesoscutum rather dense, and subappressed except on anterior part of scutum. Hair of tergites uniformly dense and appressed, except that it is longer and erect at base of tergite 1. Hair of venter thin, ferruginous on the disk of segments 4 and 5, which have a dense whitish apical fringe. Hair of tergite 6, at apex of tergite 5 and on inner side of basitarsi, ferruginous. Scopa of hind legs and hair on under side of front femora moderately dense. Length, 7–8.5 mm.; anterior wing, 5.9–6.8 mm.

Described from 2 males, 20 females (holotype male, allotype and paratypes) collected at flowers of *Sphaeralcea orcutti,* near Westmoreland, Imperial County, California, May 31, 1930; and 1 male (paratype), Tolleson, Arizona, on *Sphaeralcea,* May 29, 1933 (Timberlake).

Diadasia sphaeralcearum **affinis** n. subsp.

Male.—Like the type of *D. sphaeralcearum* Ckll., except that the basal area of propodeum is tessellate and dullish, instead of polished. The genitalia of the two subspecies agree closely. In *affinis* the dilation of the sagittae, ending basad on each side in a strong angular projection, is preceded by a small distinct semicircular notch which makes the angular projection more prominent. In *sphaeralcearum* this notch is broader and much shallower. Sixth ventrite in both subspecies covered with thin short pile, becoming denser at base and forming on each side a dense tuft. Apex of hind tibiae beneath without a lobe over base of spurs. Length, 6.5–7.5 mm.; anterior wing, 4.8–6 mm.

Female.—Typical *sphaeralcearum* not at hand for comparison, but presumably the main difference will lie in the dull basal area of propodeum in *affinis. Affinis* closely resembles *D. tuberculifrons* Timb., but is smaller, less robust, lacks the two shining bosses on the frons and has the puncturation of head and thorax fine rather than minute. Punctures on posterior middle of mesoscutum and on disk of scutellum rather sparse, those on anterior half of scutum stronger and closer. Length, 7–8 mm.; anterior wing, 5.5–6.3 mm.

Holotype male and allotype collected near Westmoreland, Imperial County, California, at flowers of *Sphaeralcea orcutti,* May 31, 1930 (Timberlake). Also the following paratypes: 3 males, 4 females, taken with the types; 4 males, 4 females, Tolleson, Arizona, on *Sphaeralcea,* May 28–29, 1933 (Timberlake); 1 male, 13 females, Blythe, California, Oct. 16, 1934 (C. M. Dammers); 2 males, 42 females, Blythe, Nov. 2, 1936, mostly at nests in ground (Dammers); 3 males, 6 females, Blythe, on *Sphaeralcea emoryi* and one at nest in ground, Nov. 22, 1936 (Timberlake); and 4 males, 9 females, Blythe, on *Sphaeralcea emoryi,* July 15–16, 1938 (Timberlake).

Diadasia angusticeps n. sp.

By having the head as long as wide and the inner orbits hardly divergent above, this species shows similarity to *D. bituberculata* (Cress.), but is otherwise quite different. By the male genitalia it shows relationship to *D. tuberculifrons* Timb., *D. sphaeralcearum* Ckll., *D. vallicola* Timb. and *D. afflicta* (Cress.), but differs in having black hair on the disks of tergites 2 to 6 as well as in the shape of the head. The head appears to be slightly longer than wide, but measurements show that the length and width are about equal.

Male.—Black, the spurs and tarsi ferruginous. Flagellum somewhat brownish beneath. Tegulae dark castaneous. Wings dusky hyaline, the nervures fuscous, with a reddish tinge. Head as long as wide, the inner orbits very feebly divergent above. Joint 3 of antennae nearly equalling 4 + 5. Middle joints of flagellum slightly longer than wide. Head and thorax finely, closely punctured. Punctures of vertex somewhat finer, with a small impunctate space on each side, just exterior to lateral ocelli. Basal area of propodeum polished. Middle and hind femora and tibiae moderately incrassate. Hind tibiae not lobate beneath at apex, and gradually narrowing toward base from the thickest part half-way between middle and apex. Spurs weakly curved at apex. Teeth at apex of tergite 7 small, blunt, rather close together. Pubescence pale ochraceous, paler beneath, moderately long and dense on head and thorax, but area between upper ends of eyes nearly nude. Hair on outer side of tibiae dense and subappressed. Hair of abdomen depressed, except on tergite 1, black on disk of tergites 2 to 6. Apical band on tergites 1 to 6 dense, white, moderately narrow and even, becoming slightly wider on 5 and 6. Hair of tergite 7 brown, paler at apex. Hair of venter mainly whitish. Ventrite 6 with short erect brown pile, becoming longer but not denser on each side near base. Length, 9 mm.; anterior wing, 6.8–6.9 mm.

Female.—Similar to male. Antennae shorter, the middle joints of flagellum wider than long. Clypeus considerably more coarsely, subrugosely punctured. Pubescence more ochraceous on frons and mesonotum. Hair on disk of tergites 2 to 4 and at base of 5, black or brown-black, thinner than in male, the surface well exposed and shining. Apical band on 1 to 4, white, moderately narrow, somewhat widened in middle, especially on 4. Apical band on tergite 5 broad, covering about apical half, whitish at sides, otherwise ferruginous, sometimes overlaid with pale ochraceous hairs across the middle. Hair on tergite 6 and venter ferruginous, that on inner side of tarsi a little darker. Scopa pale ochraceous, more or less tinged with brown, especially on basitarsi, rather thin, some of the hairs, including most of those on basitarsi, stiffer and not plumose. Front femora with thin long hair beneath. Length, 8–10 mm.; anterior wing, 6.8–7 mm.

Holotype male and allotype, California Hot Springs, Tulare County, California (E. R. Leach); 1 male, 10 females (paratypes) collected with the types; 2 males, 5 females (paratypes), Shasta County (E. R. Leach); and 1 female (paratype), at flowers of *Calochortus,* near Pinehurst, Sierra Nevada Mountains, 3500–4000 feet, Fresno County, June 12, 1925 (Timberlake).

(*To be continued.*)

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A NEW PARASITIC BEETLE FROM CALIFORNIA (RIPIPHORIDAE).

By H. S. Barber,
Bureau of Entomology and Plant Quarantine, United States
Department of Agriculture.

Many adults of the *Ripiphorus* below described were seen in a restricted area near Blythe, Calif., in mid-July and again in mid-August, 1938, by Commander C. M. Dammers and Mr. Geo. P. Engelhardt. The latter writes that the bottom lands along the California side of the Colorado River near Blythe are being greatly changed by extensive agricultural development—trees and brush removed, ditches cut, and embankments thrown up by dredges. When the area was visited August 13, 1938, the parasitic beetles and their host bees were flying in abundance and alighting on the tips of a brushy plant, 3 to 5 feet high with inconspicuous flowers, suggestive of *Hymenoclea*. Courting and mating pairs of the beetles could be seen but there seemed to be several times as many males as females. The bees have been sent to Mr. P. H. Timberlake and described by him as a new species which he has called *Diadasia consociata*. They were busily gathering pollen and were easily traced to a nearby sandy clay bank, where their burrows penetrated several inches and yielded pollen-filled cells or bee larvae in various stages, as well as adults of the parasitic beetle with last larval and pupal skins, but living larvae of the parasite were not observed. The excessive heat, 120° F., in the bottom lands near the river discouraged prolonged investigation, but the series of almost 100 *Ripiphorus* and the data supplied are admirable. In his brief letter transmitting his sample Commander Dammers writes, possibly referring to his visit in July, that the beetles were on plants which were not yet in bloom and which were then not being visited by the bees.

Mr. J. C. Bridwell permits me to abstract observations he has been making near Washington, D. C., on another species of *Ripiphorus* (probably *R. stylopides* Newn.) which is parasitic upon *Augochlora pura,* since they are suggestive of the developmental stages of the western species and show contrast in climatic and environmental adaptations. He has discussed the more or less confused and conflicting literature with me and has exhibited most of the larval stages. Fertilized females of this bee hibernate in soft rotten logs and hibernating triungulinids (first-stage larvae) of *Ripiphorus* attached to their hairs are also found awaiting the nest-making activity of their host. One of them must be left in the stored cell when the bee makes and seals it the following spring or summer, and when the larva of the bee is sufficiently grown it enters the body of the grub. There is remains, still in its first-stage larval skin, until the bee larva reaches the prepupal condition, but it becomes so enormously distended that the intersegmental membrane grows to perhaps a hundred times the area of the original overlapping sclerites. It then cuts its way through one side of the thorax of the larva, and moults but remains attached to its host, curled transversely around its neck. It feeds through the hole made in issuing from its host, usually leaving only the skin of the latter; then pupates and transforms. Some of the details of this outline have not been personally observed.

Apparently, then, the size of the adult parasite should be nearly that of its host which, being standardized by the mass of food stored by the parent bee, will vary but little. But what happens when, or if, some of the multitude of triungulinids attach to other species of bees and may still mature and breed? Their size should be smaller or larger, according to host size, and they would be difficult to recognize as conspecific with a known standard. Such problems confront us in numerous groups of parasitic or highly specialized predators, such as *Brachynus, Pyrota, Catogenus, Sandalus,*[1] etc., where the larvae may fortuitously attack host species of different sizes, and the taxonomist is apt to find that his samples fall into two or more standards of size. *Ripiphorus* collected about Washington show enormous range in size but we do not know whether this indicates diverse sizes of hosts or several species each peculiar to a single host. If the latter, one must marvel at the intricate selective chemotropic stimuli which should guide the triungulinids towards success. It is doubtful if such a condition exists. The wastage must be excessive if a diversity of attractive flower visitors deceive their instincts for phoresy.

Among the recorded life cycles of ripiphorids compiled and discussed by Balduf, 1935 (Bionom. Entomoph. Coleop., p. 112–114) that of the very strange European genus *Metoecus,* which is parasitic in the paper nests of the social wasp *Vespa vulgaris,* is included, as *Rhipiphorus paradoxus,* with the American and the European species of *Ripiphorus* which parasitize solitary bees. The two genera are very distinct and the acceptance by Schilder, 1924 (Deutsch. Ent. Zeit., p. 237) of the validity of *Metoecus* Dejean is correct except that he cites the title page date 1833, whereas the third fascicle of the Dejean Catalogue containing this name was published about June, 1834.

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[1] The possibility that *Sandalus* represents an ancestral type of the meloid series should be considered from all aspects.

A male *Ripidius pectinicornis* Thunb. (*Symbius blattarum* Sund.), hitherto unknown in the United States, but parasitic in the common German roach, was found in a fruit-fly trap in Levi County, Fla., April 16, 1930, and it is hoped that an opportunity to restudy its life cycle may be found. Its parasitic habits seem not to have been observed for more than a century and its triungulinid first-stage larvae are still unknown.

Although emendations and reversions to original spelling are annoying because of different positions in indices, the lesser of two evils would seem in general to be the use of the originally proposed spelling. Especially is this desirable in cases where no derivation of the name is offered at time of proposal. To the great majority of users, names have now come to mean nothing more than the zoological unit for which they are the symbol, and relatively few users have sufficient classical experience to be annoyed at the absence of an aspirate in a technical name. This suppression of the harsh sound seems to have been a part of the French phonetic ideal and their spelling of names was by choice. Emendations of these names on the cultural standards of other schools of ancient learning have greatly complicated our already very complex nomenclature which is yet but a small fraction of what will be needed. The emendations *Rhipidius* and *Rhipiphorus,* and the derivative family name Rhipiphoridae (Gerstaecker, 1855) are here inserted only for cross indexing. In their original publications neither Thunberg nor Bosc cited a derivation for the generic names, which they spelled *Ripidius* and *Ripiphorus,* and the latter is valid the year previous to the date 1792 which is usually cited. This earlier publication (La Médecine éclairée—Fourcroy's—Vol. 1. 1791, p. 327) is little more than an advance abstract of the formal paper (Jour. Hist. Nat., Vol. 2, 1792, p. 293—not seen by the present writer), but contains characterization of the genus based upon specimens taken near Montpellier by Dorthez.

The following species is named in appreciation of the energetic entomologist who found and marveled at the first specimen of this odd parasitic beetle.

Ripiphorus dammersi, n. sp.

Abdomen orange red in both sexes, the first and sometimes the second tergite more or less infuscate; head and pro-, meso-, and metanotum shining, black above and below, the pronotum often with a pair of lutescent prescutellar spots, upper surface

> except the front practically impunctate; elytra yellow, smooth, shining, impunctate; antennae of male yellow, the long compressed rami feebly infuscate apically; antennae of female black; legs yellow, the middle femora usually infuscate at base and the hind legs mostly brown except apices or outer edges of the joints, which are pale; wings conspicuously infuscate from before middle nearly to apex. Length 4.5–6 mm.

The type series of nearly a hundred specimens was collected at Blythe, Calif., July 15, 1938, by C. M. Dammers (13 ♂, 1 ♀) and August 13, 1938, by G. P. Engelhardt and C. M. Dammers (73 ♂, 10 ♀).

Holotype ♂ and 56 paratypes (50 ♂, 6 ♀).—U. S. National Museum, No. 53082. Other paratypes returned to Commander Dammers and Geo. P. Engelhardt.

This species displays characteristics which lead through the key in the revision by Rivnay, 1929 (Mem. Amer. Ent. Soc., No. 6, pp. 42 and 54) to the four species having the pronotum impunctate and forming group *popenoei*, from all of which it differs in color and in its much smaller size. This varies but little in the type series and the size differences, as indicated in the above-measured lengths, are deceptive because various postures of the specimens permit no standard of entire length. Some variation in color is evident in the type series, chiefly in the gradational appearance of a triangular yellow area on sides of the black metasternum behind the middle coxae. The prescutellar spots are often obsolete, and the infuscation of the bilobed first abdominal tergite, which usually consists of four dark spots, may be suppressed or may enlarge nearly to cover this sclerite. In the latter condition a pair of small infuscate spots are sometimes present on the second tergite also.

Ennearthron oblongum (*E. oblongus* Blatchley, Beetles of Indiana), a little representative of the beetle family Ciidae, 1–1.5 mm. long, was found abundant in *Polyporus* bracket fungus at Detroit, Mich., April 27, 1938. This little fellow has horns on both the head and thorax.—GEO. STEYSKAL, Detroit, Mich.

THREE NEW SPECIES OF MIRIDAE FROM NORTH AMERICA (HEMIPTERA).

By Harry H. Knight,
Iowa State College, Ames, Iowa.

The species here described have been in the author's collection for some years but the miscellaneous description of species has always been deferred in favor of more important revisions of genera. The need for names in other publications, particularly the "Miridae of Illinois," requires that names be established.

Neolygus carpini n. sp.

Runs to *ostryae* Kngt. in my key (Hem. Conn., 1923, p. 581) but distinguished by the smaller size and shorter, differently shaped prongs on the male genital claspers.

Male.—Length 4.7 mm., width 2 mm. Head: width .99 mm., vertex .346 mm. Rostrum, length 1.9 mm., extending slightly beyond hind margins of posterior coxae, yellowish, apex brownish. Antennae: segment I, length .65 mm., pale; II, 1.8 mm., pale, apical one-third black; III, 1.12 mm., yellowish, fuscous apically; IV, .69 mm., fuscous. Pronotum: length .95 mm., width at base 1.64 mm.; yellowish green and tinged with brown but without definite streaks or vittae. Scutellum yellowish brown, scarcely darker at the sides. Hemelytra yellowish translucent, clavus evenly shaded with brownish, apical area of corium with dark brown; cuneus uniformly translucent, scarcely tinged with yellowish. Membrane and veins rather uniformly fuscous brown. Body beneath pale to yellowish, a fuscous band along lateral margins of venter, also extending across pleura of the thorax. Legs yellowish to brown; femora uniformly brownish, without bands, although the apices are paler; tibiae pale yellowish, spines brown; tarsi brownish, apices fuscous.

Female.—Length 5 mm., width 2.16 mm. Head: width .96 mm., vertex .37 mm. Antennae: segment I, length .58 mm.; II, 1.86 mm., yellowish, apical one-third black; III, 1.08 mm.; IV, .69 mm. Pronotum: length .95 mm., width at base 1.73 mm. More robust than the male but very similar in color and pubescence.

Holotype: ♂, June 12, 1922, Faribault, Minnesota (H. H. Knight); author's collection. *Allotype:* same data as the type.

Paratypes: 5 ♂, 5 ♀, taken with the types. IOWA—♂, July 11, 25 ♂♀, July 12, 1927, on *Carpinus caroliniana;* 14 ♂♀, June 21, 1928, 2 ♀, June 14, 5 ♂, 4 ♀, June 18, 10 ♂♀, July 16, 1929, Ames (H. H. Knight); 2 ♂, June 11, 1929, Ames (H. B. Mills). ILLINOIS—♀♂, June 14, 1933, Dolson (Frison & Ross).

Lygidea salicis n. sp.

Allied to *annexus* (Uhler) but differs in the longer second antennal segment and the shorter, more recumbent pubescence on antennae; segment II equal to (♀) or exceeding (♂) width of pronotum at base. Differs from *obscura* Reut. in the shorter rostrum.

Male.—Length 5.6 mm., width 2.2 mm. Head: width 1.21 mm., vertex .60 mm. Rostrum, length 1.77 mm., just attaining posterior margins of middle coxae, pale, apex black. Antennae: segment I, length .65 mm., black, slender apex pale; II, 1.99 mm., fusco-brownish, basal one-fourth black, pubescence rather short and recumbent; III, 1 mm., fuscous; IV, .91 mm., blackish. Pronotum: length 1.02 mm., width at base 1.8 mm.; disk punctate, transversely rugulose; black, collar except behind eyes, median line of disk, two blotches behind outer half of calli, disk of calli, narrow basal margin, dorsal margin and ventral one-third of propleura, pale. Scutellum pale, a wedge-shaped mark each side of median line, brownish black, mesoscutum black.

Hemelytra brownish black, embolium except apically, cuneus except reddish spot on apex, pale translucent. Membrane uniformly dark fuscous, paler bordering apex of cuneus, veins pale. Clavus and corium clothed with pale to silvery, somewhat sericeous pubescence. Ventral surface white to yellowish, a broad lateral, longitudinal stripe on thoracic pleura and sides of venter, reddish brown to black. Legs pale, hind femora with two, subapical reddish brown annuli, tibial spines yellowish, apical segment of tarsi fuscous.

Female.—Length 5.9 mm., width 2.3 mm. Head: width 1.25 mm., vertex .65 mm. Antennae: segment I, length .60 mm., black; II, 1.9 mm., pale, base and apex fuscous to black, more slender than in the male; III, 1.04 mm., fuscous; IV, .95 mm., blackish. Pronotum: length 1.08 mm., width at base 1.88 mm. Very similar to the male in color and pubescence, although more broadly pale on disk of pronotum.

Holotype: ♂, July 12, 1919, Hennepin Co., Minnesota (H. H.

Knight); author's collection. *Allotype:* same data as the type. *Paratypes:* 84 ♂♀, taken with the types on *Salix amygdaloides.* MINNESOTA— 2 ♀, Aug. 20, 1920, 4 ♂, 4 ♀, Aug. 9, 1922, Two Harbors (H. H. Knight); ♀, Aug. 12, 1922, Beaver Dam, Cook Co. (H. H. Knight). MICHIGAN—♂, July 29, 1919, Gogebic Co. (T. H. Hubbell). ILLINOIS—♂♀, June 30, 1932, Galena (Dozier & Mohr), on *Salix.* NEW YORK—3 ♀, Aug. 1, 1913, Batavia (H. H. Knight); ♂, July 7, 1919, ♀, July 13, ♀, July 20, 1920, Cranberry Lake (C. J. Drake), on *Salix.* CANADA—♀, Prince Edward Co., Ontario (Brimley).

Parthenicus nigrellus n. sp.

Distinguished from other members of the genus by the black color and pale second antennal segment.

> Male.—Length 3.3 mm., width 1.6 mm. Head: width .73 mm., vertex .34 mm. Rostrum, length 1.4 mm., just attaining hind margins of posterior coxae. Antennae: segment I, length .39 mm., black; II, 1.18 mm., pale, tinged with reddish; clothed with pale and dusky pubescence; III, .91 mm., pale; IV, .60 mm., fuscous. Pronotum: length .60 mm., width at base 1.25 mm.
>
> Form ovate, robust; color fuscous black with a tinge of red in the hypodermis which is more pronounced on ventral surface, tips of femora, and base and apex of cuneus; membrane uniformly fuscous, veins reddish. Legs black, tibiae pale except basal one-third, tarsi pale, apices fuscous. Clothed with pale to yellowish pubescence and intermixed with silvery, scale-like hairs. Genital claspers distinctive, the right clasper forming a V-shaped loop which turns back over middle of genital segment with spatulate apex.
>
> Female.—Length 3.5 mm., width 1.7 mm. More robust than the male but very similar in form, color and pubescence.

Holotype: ♂, July 6, 1929, Ames, Iowa (H. H. Knight); author's collection. *Allotype:* ♀, June 14, 1932, College Station, Texas (H. G. Johnston). *Paratypes:* ♂, 2 ♀, June 11, 1934, Monticello, Illinois (Frison & DeLong).

TWO NEW WESTERN TIGER BEETLES, WITH NOTES (COLEOPTERA—CICINDELIDAE).

By Mont A. Cazier,
University of California.

The writer would like to take this opportunity to express his gratitude to Charles W. Leng whose excellent collection largely forms a basis for the writer's studies in the *Cicindelidae*. Thanks are also extended to those who contributed specimens recorded in what is to follow, to Dr. E. C. Van Dyke for his advice and encouragement and to R. P. Allen whose collecting ability made possible the new descriptions contained herein.

Cicindela alleni sp. nov.

Medium sized, shining blue-green, immaculate, bare above, sparsely hairy beneath. *Female.*—Head with eyes wider than pronotum, bare except for two ocular setae, granulate-strigate, impunctate; front moderately deeply excavated, striae prominent: clypeus and genae bare; labrum wide, produced medially, with a single sharp median tooth, white, narrowly margined with black; palpi purplish-green, maxillary sparsely hairy, second segment of labial densely hairy; mandibles tridentate, cupreous black with white base; antennae green, first to fourth segments with prominent terminal setae, bases bare. *Thorax* bare, about as long as wide, side margins rounded, sub-parallel, slightly narrowing at base, widest at about middle, basal and apical transverse impressions deep, median longitudinal impression prominent; middle of disk along impression and side margins transversely strigose, remainder smooth with occasional shallow, irregular impressions; color shining green, faintly sericeous, impressions dark purple. *Elytra* gradually widening to apical third, evenly rounded to apex, apical margins unserrated; surface uniformly punctate throughout, punctures separated by about their own widths, basal punctures only slightly deeper than apical, humeral impression with large setigerous punctures confined to area immediately behind umbone, irregular discal row of prominent foveae extending to apex, terminating near suture; color uniformly shining blue-green, slightly sericeous. *Beneath* sparsely pilose, pile on side margins of basal abdominal segments decumbent, few erect hairs in center of abdominal segments; head and thorax blue-green with tinges of cupreous and purple, abdomen cupreous-purple basally, fourth and fifth segments reddish-brown;

legs green, sparsely clothed with white hair, front coxae and femora more densely pilose than rest of surface, trochanters bare. Length 10.8 mm., width 4.0 mm.

Male same as female except for the color which is dull green (due to its being greasy) except for side margins of elytra which are as in female, smaller size and by having more reddish-brown on abdomen beneath. Length 9.0 mm., width 3.5 mm.

Holotype female, allotype male in the author's collection, collected in the Signal Mts., Howard Co., Texas, August 28, 1938, by R. P. Allen after whom the author takes pleasure in naming the species.

When first observed this species was thought to be the green variation of *horni* which occurs in New Mexico and Texas but upon careful examination it proved not to be this species and sufficiently different from any previously described to merit specific standing. From *horni* and *horni ritteri* it can at once be distinguished by the much deeper excavation between the eyes, deeper and more pronounced head and pronotal striae and by having the elytra uniformly punctate throughout rather than only basally as in *horni*. *C. alleni* resembles *horni* in its shining appearance, general shape of elytra and in being only sparsely pilose beneath.

C. *alleni* resembles *pimeriana* a good deal but may be easily separated because the latter species has a short flat labrum, densely pilose front and basal antennal segment, thorax widest in front of middle, elytral apices serrate, and beneath it is moderately clothed with long white pile. Of the species previously described, *alleni* is probably most closely related to *nigrocoerulea* and its varieties *robusta* and *bowditchi* being readily separated, however, by its narrow form, produced labrum, deeply impressed, bare pronotum and by its shining color.

Cicindela nevadica subsp. **tubensis** subsp, nov.

Medium sized, brilliant cupreous, markings as in *nevadica* subsp. *knausi* Leng, pronotum and head sparsely clothed with white pile, beneath densely clothed with decumbent white pile. *Female.*—Head granulate-strigate, clothed throughout with short white pile; clypeus with sides and center clothed with short white pile, genae moderately densely pilose; labrum white, short, not produced in middle, unidentate, submarginal row of hair anteriorly; palpi testaceous except for outer portion of last segment which is purple; mandibles white at base, apically cupreous-black; antennae with segments one to four cupreous-red, segment one uniformly, sparsely clothed with white pile above. *Pronotum* brilliant cupreous, nearly square, impressions moderately deep, surface granulate-strigate, sides, front margin and edges of median longitudinal impression clothed with short white pile. *Elytra* cupreous, uniformly, shallowly punctate, punctures green; widest at about middle, apex broadly emarginate; markings consist of broad marginal band connecting all lunules, humeral lunule obliquely descending, moderately hooked at tip, middle band broad, complete, narrowly separated from suture, recurved at tip, inner margin of descending arm irregular, apical lunule broad, lateral arms projecting toward base. *Beneath* cupreous with occasional greenish tinges, abdomen piceous medially; sides of thorax and abdomen densely clothed with short decumbent white pile; legs cupreous, sparsely clothed with erect white pile, trochanters brown, those of front and middle legs with prominent sub-terminal hair. Length 11.5 mm., width 4.1 mm.

Male same as female except for sexual differences and in having the humeral lunule broadly connected to middle band, apical lunule with inner projections only faintly indicated. Length 10.5 mm., width 4.0 mm.

Holotype female, allotype male in the author's collection, collected at Tuba City, Coconino Co., Arizona, July 5, 1937, by R. P. Allen to whom the author is indebted for the privilege of studying and making known this subspecies. Five male, nine female topotypical paratypes deposited in the collections of R. P. Allen and the author.

This subspecies properly belongs with *nevadica* and is closely associated with subspecies *knausi* from which it can be distinguished by its brilliant cupreous color, lack of green or blue, and its confined distribution in northern Arizona. The series is uniformly cupreous but does show considerable variation in the extent of the markings. In one specimen the inner tip of the middle band is connected with the apical lunule. None of the specimens are as elongate as *cuprascens* subsp. *sperata* and do not have the markings as slender as in that subspecies.

During the past several years the author has accumulated a good deal of previously unpublished information concerning the distribution of several species of western tiger beetles and it seems desirable, at this time, to make known a portion of this information.

Cicindela tranquebarica borealis Harris

A large series of a form referable to this variety was taken at Benton's Crossing, Mono Co., California, September 8, 1935 (F. R.

Platt, M. Cazier). In the evening just before sundown large numbers were collected by hand under cow chips on the dry alkali lakes. During the day they were taken in flight on these dry lakes as well as in the vicinity of Owens River. They are slow fliers and are easily captured.

Cicindela tranquebarica kirbyi Lec.

This variation has, as far as I know, never been previously recorded from California. Typical specimens were taken at Barstow, San Bernardino Co., California, April 15, 1938 (T. G. H. Aitken), and in Cuyama Canyon along the Santa Maria River, Santa Barbara Co., California, March 6, 1937 (H. B. Leech, E. S. Ross, M. Cazier). The distribution has thus been extended from Colorado and New Mexico through Utah (Willow Creek, September 20, 1932, Marysvale Canyon, June 9, 1924, J. Sugden) and California by way of Owens Valley, Barstow and the Santa Maria River to the Pacific Coast.

The specimens taken along the Santa Maria River vary in color from cupreous-brown to cupreous-green, the latter specimens resemble, to a marked degree, specimens of subspecies *vibex* taken at Coalinga, Fresno Co., California, March 5, 1937 (M. Cazier). These specimens of *vibex* have abnormally wide lunules but are, as a rule, smaller in size than the specimens of *kirbyi*.

Cicindela tranquebarica propinqua Knaus

Previously recorded from Nevada and Death Valley, California but recently taken in considerable numbers in California north of the Tehachapi Mts. in the following localities: Exeter, Tulare Co., March 28, 1934 (R. P. Allen); Kerman, Fresno Co., October 30, 1927 (R. S. Wagner); Helm, Fresno Co., March 16, 1924 (R. S. Wagner); Wheatville, Fresno Co., March 4, 1938 (M. Cazier).

Cicindela tranquebarica inyo Fall and *owena* Fall

A long series collected in Owens Valley, Inyo Co., California, May 20 to June 2, 1937 by members of Dr. E. C. Van Dyke's summer 49 course shows every gradation in color from typical black *owena* to the blue and green *inyo*. One specimen referable to *owena* is from Tejon, Kern Co., California, July 1932.

Cicindela tenuicincta Schpp.

This distinct species was taken sparingly by Dr. E. C. Van Dyke and members of his summer course at Owen's Lake, Inyo Co., California, May 20 to June 2, 1937. Most of the specimens examined to date from Utah have been brown in color with little variation, wheras, in the California series there are several specimens that are definitely cupreous-green throughout. This same color variation exists also in *hirticollis* and *bellissima,* etc., the latter species also occurring in a black phase.

Cicindela plutonica Casey

Specimens of this rare and desirable species were taken by H. P. Lanchester at Parma, Idaho, October 14, 1932, at a relatively low altitude. The species is undoubtedly alpine since it occurs only at high elevations in the southern portion of its range. This progression also exists in *longilabris.*

Cicindela eureka Fall

This species has, up to now, been known only from a comparatively small area in Humboldt Co., California and southwestern Oregon. I have on hand one typical specimen collected at Salem, Oregon, September 4, 1932 (Joe Schuh).

Cicindela pusilla lunalonga Schpp.

Recorded previously from California and Oregon but also now known from Prescott, Arizona, June 1909 (H. Kusher). An interesting black variation has been collected by P. H. Timberlake at Riverside, Riverside Co., California, May 24, 1925 (in river bottom). In the author's opinion these black individuals are direct offshoots of *lunalonga,* whereas, larger, more parallel sided specimens taken at Benton's Crossing, Mono Co., California, July 6, 1935 (F. R. Platt), seem to be more closely related to *pusilla* or *pusilla imperfecta.* This complex appears to be very plastic, new variations appearing in almost every individual locality and even within the same locality.

Cicindela lepida Dej.

Known only from various localities in and east of New Mexico until a recent collection by R. P. Allen in Tuba City, Coconino Co., Arizona, July 4, 1937. All specimens taken are typical of those taken in eastern localities.

PROTECTIVE ODORS AMONG THE ICHNEUMONIDAE (HYMENOPTERA).

By Henry K. Townes, Jr.
Department of Entomology, Cornell University.

While collecting Ichneumonidae, I have become interested in the fact that certain of them give off a strong odor. In all those observed to have odor, except *Chlorolycorina,* it is of the same character—a strong penetrating musky smell reminding one somewhat of burnt machine oil and very similar to that of some carabid beetles. Between different genera there are some slight differences in character, for instance the scent of *Alexeter* is somewhat sharper than that of *Pimpla.* With practice one could probably distinguish between others. *Chlorolycorina* smells like lemon verbena, or like citronella but slightly more fragrant. It is just possible in the case of *Chlorolycorina* that the odor is derived in some way from *Myrica asplenifolia,* an aromatic plant on which I have collected nearly all of my specimens of this genus.

The ichneumonids in which I have noticed a definite odor, listed in order from those with the strongest scent to those with the weakest, are: *Pimpla* of authors (*pedalis, tenuicornis, aequalis,* and *aquilonia*), *Apechthis* (*picticornis* and *annulicornis*), *Banchus* (*pallescens, canadensis, flavovariegatus, flavescens,* and an undetermined species), *Alexeter* (*honestus, canaliculatus,* and *tarsalis*[1]), *Chlorolycorina* (*albomarginata*), *Exochus* (*atriceps* and *albifrons*), *Mesoleius* (species near *fissus*), *Phaeogenes* (two undetermined species), *Odontomerus* (*albotibialis*), *Megarhyssa* (*lunator* and *greenei*), and *Ephialtes* of authors (undetermined species). In *Pimpla, Apechthis, Banchus,* and *Alexeter* the odor is so strong that while collecting with a sweeping net, the sense of smell tells when one of these has been caught. *Exochus* has an odor which, in comparison with its size, is almost as strong as in the preceding genera. In *Mesoleius* and *Phaeogenes* the odor is weak, while in *Odontomerus, Megarhyssa,* and *Ephialtes* it is so weak that it may be merely the general body odor and not the product of special glands; since many other ichneumonids have a smell almost, if not quite, as definite.

Since they are related to odoriferous genera, I had expected to find scents in *Itoplectis* (*conquisitor*), *Theronia* (*melanocephala* and *fulvescens*) and *Colpotrochia* (*trifasciata*) but as far as I can tell they are odorless. I have also collected a specimen each of two undetermined species of *Exochus* which apparently did not have an odor.

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[1] *Alexeter tarsalis* has formerly been placed in *Holmgrenia,* but the complete areolet shows that it belongs in *Alexeter,* in spite of its stocky build.

It seems probable that these odors have a protective function. Yellow-jackets (*Vespula* spp.) constantly search the haunts of ichneumonids for prey and would probably capture more of them were they not thus protected. The only observation I have that would confirm my belief in the repugnatorial function is that ichneumonids having a smell do not seem to give it off except when captured. Although one can easily smell a captured specimen still in the net at arm's length, I have not noticed any odor from specimens among nearby bushes.

The presence of protective odors in an insect raises the question as to whether or not there are mimics. In the case of the genus *Pimpla* I believe that there are. *Pimpla pedalis* is abundant in the Canadian Life Zone and here also are found several entirely unrelated species that resemble it closely. The sawfly, *Tenthredella rufopectus,* is one of the commonest mimics. *Ichneumon velox* (male only), *Homaspis slossonae,* and *Xenochesis cinctiventris* are ichneumonid mimics in the Canadian Zone. In the Transitional Zone, where *Pimpla pedalis* occurs commonly, *Alexeter tarsalis* is a good Müllerian mimic. The smaller species of *Pimpla* in the northeastern United States are probably mimicked by species of *Scambus, Tromatobia, Zaglyptus,* and other black species with red legs. *Exochus* and *Mesoleius* would serve as models for these along with *Pimpla.*

Another Central American Social Wasp, Accidentally Introduced into the United States.—A collection of wasps received recently for naming from Mr. James E. Gillespy, of the Agricultural and Mechanical College of Texas, includes a small female or worker of *Gymnopolybia areata* (Say), taken at San Marcos, Texas, July 17, 1937, in a bunch of bananas (R. W. Strahdtmann). It is indistinguishable from the specimens of this common social wasp I have seen from Mexico, Guatemala, the Republic of Honduras, Costa Rica, Panama, Colombia and Brazil (Chapada). Say (1837, Boston Jl. Nat. Hist., I, p. 388) described the species as *Polistes areata,* from specimens which he collected himself in Mexico, presumably near Vera Cruz. *Stelopolybia sulfureofasciata* Ducke (1910, Ann. Mus. Nat. Hungarici, VIII, pp. 519 and 522) is a synonym. It is most probably not *Vespa fulvofasciata* Degeer (1773), as certain authors have claimed.—J. Bequaert, Harvard University Medical School, Boston, Mass.

SEVEN NEW AMERICAN TINGITIDAE (HEMIPTERA).

By C. J. Drake and M. E. Poor, Ames, Iowa.

The present paper includes the description of seven species of South, Central and Insular American lace bugs new to science. The holotypes and allotypes are in the Drake Collection.

Sphaerocysta propria sp. nov.

Small, yellowish brown, with fuscous markings. Pronotum convex, very coarsely pitted, tricarinate; median carina distinct but scarcely elevated on disc, a little raised on triangular process, slightly inflated at apex; lateral carinae sinuate, considerably raised on disc, very low at base and apex; paranota narrow, strongly reflexed, mostly uniseriate, slightly wider in front, the areolae small; hood rather large, inflated. Antennae rather long, moderately stout, testaceous, the apical segment mostly blackish; segment I stouter than and about one and a half times as long as II; III approximately three and one-half times as long as IV. Legs moderately stout, testaceous.

Body beneath black-fuscous. Rostral laminae chordate and widely separated on metasternum, not quite meeting behind; rostrum extending to base of mesosternum, yellowish brown, dark at apex. Bucculae contiguous in front. Elytra with sharply raised, tumid elevation; costal area narrow, biseriate at base, uniseriate behind, with the areolae much larger; subcostal area much broader, finely areolate, with five rows of areolae in widest part; tumid elevation mostly fuscous.

Length, 2.90 mm.; width, 0.75 mm.

Holotype, female, Rio Grande do Sul, Brazil. This species is perhaps most closely allied to *S. ståli* Drake from Brazil, but readily separated from it by the more highly elevated carinae, uniseriate paranota, much less strongly inflated apex of median carina and narrower costal area. *S. globifera* Stål differs in having the median carina strongly inflated behind and a much wider costal area.

Allotingis insulicola sp. nov.

Separated from *A. binotata* (Drake & Brunner) by the tricarinate pronotum, and the longer paranota which project farther forward than anterior margin of head. Head tumid, testaceous, with the frontal pair of spines long and slender, the rest obsolete; antenniferous tubercles long, curved, spinelike. Antennae moderately long, testaceous; segment I stouter than and three times as long as II, both slightly tinged with brown; III very slender, pale testaceous, twice as long as IV, the latter slender, embrowned at tip. Bucculae very broad, pale testaceous. Rostrum reaching a little beyond prosternum, the laminae distinct but not strongly foliaceous.

Pronotum testaceous, nearly flat, tricarinate, distinctly pitted, the triangular process abbreviated and notched behind, the carinae distinct but not areolate. Collar wide, finely reticulate, notched medially in front. Paranota moderately broad, whitish testaceous, uniseriate opposite humeri, quadriseriate opposite collar, projecting acutely forward at least as far as anterior margin of head, the outer margins almost straight. Elytra whitish testaceous, with a small brown dot on the almost straight nervure between subcostal and discoidal areas, and occasionally flecks on other nervures. Costal area broad, with four rows of hyaline and somewhat irregularly arranged areolae. Subcostal area biseriate; discoidal and sutural areas not differentiated, with a row of regular, quadrate areolae along inner border.

Length, 3.30 mm.; width, 1.40 mm.

Holotype, male, allotype, female, and seven paratypes, Fond-des-Negres, Haïti, 1930.

Leptopharsa pauxilla sp. nov.

Closely allied to *L. illudens* var. *variantis* Drake but readily distinguished from it by its smaller size, shorter antennae and narrower paranota and costal area. Head dark brown, posterior spines testaceous, appressed, extending forward as far as anterior margin of eyes, frontal spines obsolete. Antennae rather short, segment I brown, stouter than and twice as long as II; III testaceous, very slender, and two and one-half times as long as IV; the latter slightly enlarged, with the distal three-fourths black. Legs long, slender, yellowish brown.

Pronotum moderately convex, tricarinate, the posterior process paler and reticulate; carinae indistinctly areolate, faintly lower on disc, pale, the lateral pair slightly converging posteriorly. Paranota narrow, testaceous, uniseriate opposite humeri, biseriate in front, the areolae very small. Collar raised, not produced forward, areolate. Rostral channel constricted on mesosternum, chordate on metasternum, the rostrum brown, black at tip, extending a little beyond meso-metasternal suture. Elytra, except costal area, brown, elongate, faintly constricted beyond middle, the tips overlapping and jointly rounded behind; costal area testaceous, narrow, mostly uniseriate, a few extra cells in widest part; subcostal area narrow, with two rows of very small cells. Discoidal area slightly impressed, finely reticulate, extending beyond middle of elytra, widest near middle, there five areolae deep; sutural area more widely reticulate, with a few fuscous spots.

Length, 3.00 mm.; width, 0.80 mm.

Holotype, female, Empedrado, Corrientes, Argentina.

Leptopharsa vicina sp. nov.

Similar in form, color, and appearance to *L. distantis* Drake but distinguished from it by its much smaller size, smaller hood, narrower subcostal area and much narrower discoidal area. Head brown with five moderately long, stout, testaceous spines. Antennae moderately long, segment I brown, stouter than and twice as long as II; III testaceous, three times as long as IV, the latter darkened on the apical three-fourths. Rostral channel wide on mesosternum, wider and chordate on metasternum, the rostrum extending slightly beyond mesosternum. Pronotum very similar to *distantis* except in size; hood small, not extending back so far as anterior end of lateral carinae (in *distantis* the hood extends posteriorly beyond anterior end of lateral carinae). Elytra similar in color and shape to *distantis* but with costal area with two to three rows of areolae; discoidal area with outer boundary not strongly sinuate as in *distantis,* and five areolae deep in widest part.

Length, 2.40 mm.; width, 1.00 mm.

Holotype, male, allotype, female, and two paratypes, Williamson, Haïti, August 20, 1931, H. L. Dozier.

Leptopharsa bondari sp. nov.

Allied to *L. elegantula* Stål, but separated from it by its smaller size, larger, more bulbous hood, higher carinae and narrower, more deeply impressed discoidal area.

Head, pronotal disc and sutural reticulations ferruginous to fuscous; first antennal segment and reticulations of discoidal and subcostal areas and of triangular process of pronotum ferruginous; hood, paranota, carinae, and costal area pale testaceous. Segment I of antennae two and one-half times as long as II; III long, slender, testaceous, almost three times as long as IV; IV darkened apically. Five moderately long, slender, testaceous spines on head. Pronotum fuscous, rather finely punctate on disc, becoming lighter and more widely reticulate on triangular process; carinae testaceous, uniseriate, prominently raised, median carina slightly higher on disc, lateral carinae faintly converging posteriorly. Hood a little larger and more strongly inflated than in *elegantula*, subtruncate in front. Paranota testaceous, biseriate, almost uniform in width, reflexed. Rostral channel widening posteriorly, laminae testaceous, rostrum almost attaining meso-metasternal suture. Bucculae testaceous contiguous in front. Legs long, slender, testaceous, the tarsi slightly darkened.

Elytra broad, slightly constricted beyond middle; costal area broad, biseriate, areolae large, rectangular and hyaline; subcostal area narrow, with two or three rows of small, rectangular areolae; discoidal area three to four cells wide at widest point, impressed, long, narrowed at both base and apex with boundary veins prominent; sutural area with one large cell symmetrically placed in center of apical region.

Length, 2.60 mm.; width, 0.90 mm.

Holotype, male, allotype, female, and five paratypes from Bahia, Brazil, collected by Gregorio Bondar for whom the species is named.

Leptopharsa guatemalensis sp. nov.

Moderately elongate, narrow, gradually widening posteriorly, elytra divaricating at apex, testaceous, the areolae hyaline. Pronotum convex, black, pitted; triangular process reticulate, pale testaceous; lateral carinae considerably elevated, uniseriate, the areolae large; median carina slightly more foliaceous, uniseriate; hood moderately large, slightly projecting in front, the areolae large and semi-opaque. Paranota reflexed, moderately broad, biseriate posteriorly, triseriate anteriorly, the outer margin finely serrate and the areolae rather large and hyaline. Antennae testaceous, apical segment blackish; segment I moderately long, about two and one-half times as long as II; III two and one-half times as long as IV; head black with three long, slender, testaceous spines. Rostral laminae pale testaceous, the rostrum yellowish brown, not quite reaching base of mesosternum.

Elytra with the outer margin finely serrate, a few of the nervures partially embrowned; costal area broad, widely reticulate, mostly biseriate, with a few extra cells in the widest part beyond discoidal area; subcostal area considerably narrower, biseriate; discoidal area elongate, not quite reaching the middle of elytra, narrowed at both base and apex, moderately impressed, four cells deep at widest part. Sutural area widely reticulate behind. Legs long, slender, testaceous, tarsi dark.

Length, 3.10 mm.; width, 1.10 mm.

Holotype, male, and one paratype, male, Polochic River, Guatemala.

This species differs from *L. dampi* Drake in having narrower paranota and costal area, lower median carina and smaller hood. *L. longipennis* (Champion) is a larger species with much longer antennae and legs.

Leptopharsa sera sp. nov.

Broad, testaceous, some of transverse nervures of costal area and most of transverse nervures of sutural area dark fuscous. Pronotum mostly black, with triangular process testaceous; lateral carinae long, foliaceous, testaceous, the areolae large; median carina very strongly foliaceous, slightly arched, much higher than lateral carinae, with one row of very high, rectangular areolae, as high in front as hood. Hood moderately high, narrow, projecting over base of head. Paranota broad, reflexed, biseriate, the outer margin round and areolae rather large and hyaline. Legs and antennae dark ferruginous, tibiae and third segment of antennae lighter. Legs long and slender. Antennae with segment I two and one-half times as long as II, III long and slender. Rostrum yellowish brown, reaching to metasternum; rostral laminae testaceous. Bucculae with margins pale, contiguous in front.

Body beneath blackish. Elytra broad, the tips separated, the outer margins finely serrate, costal area broad, mostly biseriate, triseriate in widest part, with outer row of cells much larger; boundary between discoidal and sutural areas strongly and sharply raised, the subcostal area broad, three cells deep in widest part; sutural area widely reticulate; discoidal area sloping inward, short, not reaching middle of elytra, three cells deep in widest part.

Length, 3.00 mm.; width, 1.50 mm.

Holotype, female, Chapada, Brazil; allotype, male, Villa Bella, Bolivia, November 7, 1909, collected by J. D. Haseman.

The very high median carina and large areolae serve to separate this species from closely allied species.

STUDIES IN THE ECOLOGY AND BEHAVIOR OF POLISTES WASPS.

By Phil Rau,
Kirkwood, Mo.

(Continued from December.)

Work Done by Orphan annularis Wasps.

Turner has stated, and I also have elsewhere recorded the fact, that a queenless colony of *pallipes* workers, one in which its population has never had contact with queen or original workers, can perform all the functions of a normal colony, such as pulp-gathering, nest-building, food-getting, and egg-laying. We of course suspect that the same behavior applies to other species of *Polistes* wasps. That it has actually been observed to occur in *Polistes annularis* is the purpose of this paragraph. In a nest without adults, but one filled with larva and pupae (pinned at my window), I noted when the first worker emerged and I placed a drop of paint on her thorax. She assumed the duties of queen, seldom leaving the nest, and when additional workers emerged, the latter did all the work, such as bringing in caterpillar-meat and paper-pulp, and building additions to the nest. They also fed the young from day to day. As soon as an adult cut its way out of a cell, an egg was deposited in it by the workers. These infertile eggs developed into larvae, but I do not know if they reared to full maturity.[9]

The workers even went so far as to strengthen the place of attachment of the pedicle by adding much paper-pulp at the point where the pin penetrated the wall. The nest had grown to such an extent that by the middle of August I counted twenty adults on it. The wasps were driven off the nest on September 1, so that it could be removed for study, and for two weeks thereafter they could be seen about the laboratory, having refused to leave permanently; they still remembered the openings in the room and came in and out at their pleasure.

Strengthening of the Nest-support by Polistes variatus.

The wasps seem to know when the nest-support is weakened. This weakening is largely due to the increased size and weight of the nest as the larvae grow to full maturity; the workers then set to work to reinforce the pedicle at the points where it is most needed. They sometimes apply a dark rubbery substance of various thicknesses at the two ends of the pedicle. I have referred to this material in previous papers on our local species as well for those of Panamá. The substance is probably difficult for the workers to obtain in this vicinity for our local wasps use it very sparingly, but in Panamá it is more commonly used. Often, however, among our local species the material that goes into reinforcing the pedicle is wood-pulp, the same which goes into the making of cells; but in the pedicle it is much more solidly knit together than in the cells.

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[9] There are several cases on record of infertile eggs hatching, but no records, in so far as I know, of these parthenogenetic organisms growing to full maturity.

I have often wondered if wasps know just when to add new reinforcements. Some light was cast upon this subject by an orphan nest of *variatus*. This one had no adults but was filled with larvae; it was fastened to a crack in the wall by a toothpick. As worker after worker emerged over a period of three weeks, and the young larvae grew in weight from day to day, the nest began to sag. The workers one day realized its precarious position and applied much pulp around the pedicle, placing the greater part of it about the point where the toothpick penetrated the crack. The nest, therefore, was made solid and safe by this work. The main item of interest here is the fact that although the wasps were on this nest for nearly three weeks, no attention was paid to its point of attachment at the post, but as soon as the nest began to tilt they displayed sufficient foresight to remedy the dangerous situation. The reader will perhaps say that these wasps instinctively strengthen the nest at the point of attachment, but I may say in reply that perceiving the particular moment when the nest needs to be reinforced is an act of intelligence, and is somewhat comparable to the behavior of higher organisms when they find themselves in similar circumstances.

BUILDING MATERIAL USED BY POLISTES RUBIGENOSIS.

A worker *rubigenosis* was seen scraping pulp from a hard, dried stem of fox-tail grass, which is indeed very tough. It was only with great difficulty, scraping with the grain, that she finally succeeded in getting a mouthful of fibre. This species usually gathers rotten wood for building material.

ODOR EMITTED BY POLISTES VARIATUS.

One often notices the pleasantly sweetish odor that is emitted by *Polistes* wasps. I perceived it in abundance on one occasion when I disturbed a lethargic colony of *variatus* at 6:30 a. m. on August

10, 1930. The temperature at the time was 72 degrees F. When the nest was disturbed, all eight workers simultaneously raised their wings, and with them was wafted on the air a generous supply of odor. It would be of value to study the odor given off by various species of *Polistes* wasps, inasmuch as there is antagonism between the species, and this antagonism may be influenced by the odor given off by them.

Food-hunting Habits of Polistes Wasps.

There are many records of *Polistes* workers, as well as of males and queens, going to the flowers for nectar. There are also records of worker wasps, and queens too, actually seen feeding on the caterpillar flesh that is brought home for the larvae. I have, from time to time, noted instances in which food other than nectar or caterpillar-meat is eaten. While these records of unusual food items may seem unimportant, they have a bearing on two biological problems. The first is the ability to communicate to others on the nest the knowledge of new stores of food; the second is whether they find the new food stores, in the first instance, by sense of sight or smell.

In August, 1936, when a pan filled with sugar-water was placed outdoor for honeybees, two workers of *pallipes* often came during a period of two days, imbibing freely but the number at any one time was never more than two. The date (August 15) was sufficiently late in the season for the nests to have a large number of wasps on them. Honey likewise placed for bees in a shallow pan brought, from time to time, one or two wasps, either of *pallipes* or *variatus,* but never more than two at any one time. This was observed from year to year in my garden for five years. Again, for a whole afternoon, when a large bowl of stewed apples was placed outdoors to cool, only one wasp of *pallipes* came and went, straddling the liquid with legs outstretched, and even though it was quite hot, imbibed greedily of it. But never a companion did she bring with her. On another occasion I brought indoors a nest of *pallipes* filled with pupae, placed it on the mantle-shelf and then forgot all about it. About ten days later, I noticed that a number of wasps had emerged and lived peaceably on top of the inverted nest. I wondered how they survived without food, for they could not go out of doors. Looking up from my desk one morning, I saw one of the wasps picnicing on over-ripe banana-pulp which lay on a table nearby; it made several trips to it during the morning. I placed some honey on a tin lid near it and soon she made trips to the honey, carrying much of it away in her gullet. But to the honey as well as to the banana, she and she alone came; even though there were five additional workers and three males on the nest. Whether she fed those on the nest from her mouth, I do not know, but I actually did see her feeding the larvae with honey from her crop.

Now in answer to the first question,—can the wasp communicate the news of new finds of food to other wasps on the nest? It seems from the aforesaid observations, that she is unable to do so; but this statement does not fully settle the question because we know that the great majority of workers remain on the nest; not many leave it at any one time; therefore, because we see only one or two wasps at new food stores, we must not assume that the finder thereof has been unable to point the way to others. They do not go in a body to new food stores as honeybees do, because of an actual or fancied need for them at home. And then it is also possible that you may here have a situation analogous to that of the honeybee; when food stores are small, few bees go out to gather it—when it is large, many bees go out on the foraging expedition. It might be that the stores of food were too small to attract large numbers of wasps.

Now to answer our next question,—do *Polistes* wasps find food by its color or its odor? There is much to be said in favor of color; but when it comes to finding on a table a decayed banana half hidden among bottles and jars, or to finding a bowl of applesauce on a screened porch with the door only partly open, or to finding a dish of honey in the grass, I can say with reasonable assurance that the emanating odors were the factors that caused the wasp to make its way toward these semi-concealed stores. The sense of sight makes them aware of landmarks which they remember, and they return with ease to the food which they originally found through the sense of smell. It is very likely that the sense of sight brings wasps to the flowers again and again when they wish to get nectar on a summer's day, but it is also very likely that it is the odor which first attracts them to certain flowers in search of this delicacy.

Pallipes wasps are, in time of famine, able to adapt themselves to new food conditions; on two separate occasions when I had them in cages and neglected to feed them, I found that one had resorted to eating a piece of very hard dried apple; a second wasp had discovered an ancient dried pupa of a *variatus* wasp among the debris on the floor of the cage and was chewing it.

I have not been very diligent about recording the names of flowers which *Polistes* wasps frequent; I have, however, seen many *Polistes rubigenosis* going to the inconspicuous flowers of the buckrush, *Symphoricarpos orbiculatus,*[10] at Ranken, Mo., and several *Polistes pallipes* feeding at flowers of *Spirea alba* at Kirkwood.

I have elsewhere recorded the fact that an exchange of nectar takes place when a foraging wasp returns to the nest. The records of this method of feeding the "stay at homes" were for *pallipes, variatus,* and *rubigenosis.* During 1935 I made the same observations for *annularis,* and this note now makes the behavior the same for all four species found here.

POLISTES RUBIGENOSIS ATTACKING A CATERPILLAR.

A worker of this species was seen in the act of butchering a large hairy caterpillar. When I came upon the scene, she already had the victim on the sand, dorsal side up, and was in the act of turning it over. She first bit out a large portion of body-wall near the head then carefully, in a clean-cut manner, worked out the long green alimentary tract and laid it aside on the sand, leaving a neat carcass. She removed a large portion of the light yellow flesh, untainted by any of the green viscera, took a careful flight of orientation over the remaining portion, and flew away.

THE BITING POWER OF ADULT POLISTES.

That *Polistes* has the ability to bite its way out of tight places was noted on several occasions: once a *pallipes* worker bit its way out of a paper bag in which the nest from which it emerged was kept, and several times, on other occasions, they escaped by biting through cheese-cloth covers on glass jars in which they were temporarily kept.

NECTAR-GATHERING HABITS OF POLISTES WASPS.

In addition to the records already made on the honey storing habits of *Polistes* wasps,[11] I wish to add the following data gathered at Wickes, Missouri, when the *pallipes* queens were the sole occupants of the nests. On May 17, 1932, sixteen nests were examined; all were in nearly the same stage of development, having from twelve to seventeen cells to each nest, and all contained eggs or very young larvae. All of the nests except two had drops of honey in the cells; some had it in all the cells; some had it in one-third of the cells; and some in only two or three cells. At Petosi, Missouri, in a nest of *variatus,* six of the seven cells that contained eggs had drops of honey. At Sullivan, Missouri, May 5, 1930, three out of the six nests had honey drops in from two to four cells. On July 10, 1930, in a *pallipes* nest, I found large drops of honey in cells with larvae which were two-thirds grown. In a ninety cell nest of *annularis,* I found only four cells with tiny drops of honey. I have also found droplets of honey in an orphan nest of *pallipes.* Some observers think that honey-gathering for *Polistes* is of little or no importance in the economy of the species. It seems to me that it is of much importance in that it supplies food for the larvae at a time in the spring when caterpillars are scarce.

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[10] All flowers kindly identified by Dr. Edgar Anderson of Missouri Botanical Garden.

[11] The Honey-Gathering Habits of Polistes Wasps. Biol. Bull., *4:* 503–519, 1928.

Spitting Habits of Queen pallipes.

I had marked twenty queens while each was on her nest at Ranken, Missouri, on May 15, 1932; when taking them in the fingers between wads of soft cotton, many of them would spit out a large bubble of sticky fluid. I was surprised to note that the color of the drop varied considerably; in one case it was clear and transparent, in another it was green, while in yet another it was of a yellowish hue. This is evidently the nectar carried in the crop, to be deposited as globules in the cells. I have often found globules in cells with egg or larva which, after evaporation, became honey; the color of these globules is either transparent and clear, or in several shades of brown. In one exceptional case, however, it was red; so red, in fact, that I had mistaken it for a red mite. The color of this liquid is evidently due to the species of flower from which it was gathered.

How long the nectar is carried in the crop before it is deposited is not known; neither do we know if the queen herself gets sustenance from this supply while she carries it in her storage-tank.

Polistes Queens and Peony Buds.

On more than one occasion during the early days of May, I have, for several years, seen *pallipes* and *variatus* queens, as well as the solitary wasp, *Odynerus foraminatus,* go to the unopened buds of the peony flowers and lick the surface with much vigor. They could have easily bitten into the sepals, had they wished to do so, but instead, with tongue and palpi, they worked over the shiny surface. It did not appear that they were getting food, but were probably getting some waxy secretion out of the buds that could be used in nest-building. Wasps often apply a black rubbery substance in making the pedicel more secure at its base, as well as its point of attachment to ceiling or to limb; perhaps they obtain it from such plants as the peony in the form of excretions.

THE LENGTH OF LIFE OF WORKER ANNULARIS WASPS.

Three marked workers that emerged at the end of July 1930, from an orphan nest, were placed at the end of the season in a wire cage, and fed occasionally with honey, for the purpose of noting their duration of life. Temperature in the room was often down to 54 degrees F. Each one died on a separate day; the first on October 5, the second on November 16, and the third on December 31. This gave us a duration of life for these workers of approximately two months, three and one-half months, and five months respectively. The first worker emerged from this nest on July 15 (marked with orange paint). She assumed all the duties of the queen and seldom left the nest. She disappeared on September 30, having had a length of life, in spite of her arduous task as queen, of at least two and one-half months.

PARASITES ON POLISTES PALLIPES.

I have recorded the Lepidopterous parasites that hatched from nests at various times; here, however, is a species that emerged from a nest in one of my jars for the first time. The specimens were identified by Mr. Carl Heinrich as *Dicymolomia pegasalis* Ulk. They emerged from September 9 to September 11, 1932, from a nest taken at Moselle, Mo., a few weeks earlier.

THE STINGING PROPENSITIES OF POLISTES WASPS.

In observing *Polistes* wasps on their nests, it is surprising how near one may approach without being stung. It is usually when a nest is knocked down with a pole that the disturbed wasps go after one with the business-end of the abdomens. But to one who is alert and agile, getting stung may be avoided. On a few occasions I found myself not over-agile and was outwitted by the wasps.

Two stings were thus administered on July 3, 1930, by *variatus;* one sting on the hand pained for seven minutes, but one on the ear, inflicted by a second member of the colony, caused pain for four hours, the first three hours of which were agonizing.

A sting was given me a few days later by a *pallipes* worker on my little finger, above the middle joint; the spot soon became surrounded by a white ring, causing much pain. After twenty minutes, the joint began to swell enormously; the pain spread to the knuckle but was not so severe there as at the joint. The intensity of the pain diminished considerably after two hours but persisted for three additional hours and finally disappeared.

A sting was given me on another occasion by an *annularis* queen as she was getting over her sleep of hibernation. This was administered through an insect net on March 16, 1930, but was not severe, the pain lasting only a few minutes. This note is useful, however, in showing that the queen can and does use her sting while in this drowsy condition.

AUDITORY PERCEPTIONS IN POLISTES PALLIPES.

When work was being carried on to test the hearing ability of the cockroach, I had an opportunity to focus sound waves on two orphan workers that were asleep on an inverted nest which lay nearby on the table. The workers emerged about a week before the observation was made on August 25, 1937. At 8 p. m., when 1000 vibrations per second were sounded continuously from the audio-oscillator, the abdomens of the two wasps pulsated rhythmically, while, simultaneously, the sting moved in and out; a half hour later, 6000 vibrations were put on and the same behavior was enacted. In both of the cases the response was made apparently without awaking the wasps.

BEHAVIOR OF MALE POLISTES ON THE NEST.

The males of *Polistes* usually feed on the nectar of flowers, but when on the nests are often fed by incoming workers who permit them to draw nectar from their mouths. This was noted for *pallipes, variatus,* and *rubigenosis.* When a foraging worker alights on the nest, many males crowd around her in an attempt to get a chance at her mouth. The males do not depend entirely upon nectar for food, for on September 12, 1931, two males of *pallipes* were seen eating caterpillar-meat which they evidently wheedled from one of the workers.

I have described the mating habits of *rubigenosis,*[12] but I have made no observations heretofore on the mating of other *Polistes* species. I have recently observed male *pallipes* wasps attempting to mate with females and also with other males on the nests. I have also seen a male *variatus* attempting to mate with females. In all cases actual mating was not culminated. One male *variatus* was seen to indulge in some courtship antics; he would beat one foot up and down in the air quite rhythmically for several minutes in front of a queen. His foot never touched the nest, and one can best describe the behavior as just beating time in mid-air.

GREGARIOUSNESS AMONG MALE POLISTES WASPS.

I record elsewhere in these pages the behavior of *Polistes* queens during the interval between leaving the nests, and finding permanent hibernation quarters. They assemble somewhere near the nest, pile themselves one upon another, and stay there until they find their permanent winter-quarters. I was surprised to find males of *variatus* behaving in the same way. On September 6, at 7 a. m., I found on a shelf in the open-faced shed, males crowded one on top of another, where they had spent the night. There was a nest of this species about a foot away, from which they had probably come. For four or five nights they were still to be seen in the same place. Thus we see the males imitating, as it were, the behavior of queens. For queens this would have been a stepping-stone to real hibernation. For the males it can be nothing other than a death-bed.

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[12] Ent. News, 40: 17–13, 1929.

Male Polistes rubigenosis at the End of the Season,

What becomes of the males when winter sets in? They eventually die, it is true, but just how long and how far into the winter are they able to live? At Raleigh, N. C., Brimley[13] has taken males of *Polistes annularis* all winter, from November to the end of March.

To see if it is possible to carry them through the winter, I placed eighteen males of *rubigenosis,* taken from a nest at Centaur, Mo., on September 21, in a wire cage. The cage was placed in the barn where temperature and other conditions were about equal to any hibernating place the wasps themselves (if they were queens) would have selected. They were examined on November 1, when the temperature was 53 degrees F.; all were alive and they were huddled close to one another under a piece of crumpled paper at the bottom of the cage. During the early days in the cage, they were often restless, never reposing in clusters. They often ate honey from a glass rod at that time, but when it was offered to them on November 1, all but one refused to eat it. The wasps (except three of them) died at one time or another during the first three weeks of November. The three were still alive on November 23, but when I examined them on November 29, I found these had also died. Here then, we find the males of *rubigenosis* living for some months past their allotted span, but not living sufficiently long to complicate matters by appearing on the scene in the spring when hibernating queens are nestbuilding.

ERRATA.

Page 226, vol. 33—4th line from bottom should read—she carried it into one of the open cells.

Page 232.—5th line from top should read—from fifteen to thirty-four *annularis* queens.

[13] Ent. News, *19:* 107, 1908.

LIST OF THE COLEOPTERA TAKEN BY MR. GEORGE P. ENGELHARDT IN ALASKA IN 1938.

By Melville H. Hatch,
Seattle, Wash.

The present paper is a report on the Coleoptera exclusive of the Scolytidae taken by Mr. George P. Engelhardt in southeastern, south central, and central Alaska in June and July of 1938 in the course of his search for clear-winged moths.

Seventy species and two varieties were collected, of which six are unidentified and nine are from the Stikine River, B. C., leaving a total of fifty-seven species[1] and two varieties cited by name from Alaska. Of these fifty-seven, nine, including *Chrysolina engelhardti* n. sp., have not previously been recorded from the territory.

The localities and dates of collecting follow. In southeastern Alaska: Ketchikan, July 16; Wrangell Is., June 18; Juneau, June 20, July 15; also Telegraph Creek on Stikine River, B. C., June 16. In south central Alaska: Anchorage, July 9–12; McKinley National Park, July 1–5. In central Alaska: Fairbanks, June 26–28. The figures in parentheses following the locality names indicate the number of specimens collected.

I am greatly indebted to Mr. Engelhardt for permission to study this material and to retain in my collection specimens of each of the species cited. In addition I am indebted to Miss Elizabeth Farrar for the identification of the *Bembidion,* to Mr. Hugh B. Leech for the *Olisthaerus,* to Mr. M. C. Lane for the Elateridae, and to Mr. Ralph Hopping for the identification of the *Tetropium.*

Carabidae.

Scaphinotus (*Stenocantharis*) *angusticollis* Mann. Juneau (23).

S. (*Brennus*) *marginatus* Fisch. Wrangell Is. (7).

Carabus (*Apostocarabus*) *chamissonis* Fisch. McKinley National Park (1).

Elaphrus (*Trichelaphrus*) *riparius* L. Fairbanks (1).

Nebria (*Neonebria*[2]) *viridis* Horn. McKinley National Park (1).

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[1] Two species were taken both in Alaska and in British Columbia.

[2] Andrewes (Ann. Mag. Nat. Hist. (X) XVI, 1935, p. 15) points out that Latreille in 1810 validly designated *brevicollis* L. the type of *Nebria,* thus restricting *Nebria* s. str. to *Helobria* Steph. I cannot accept Andrewes' proposal to ignore this type designation, the more so as it was made by the author of the genus himself.

Bembidion (*Lionepha*) *erasum* LeC. Fairbanks (1). Not previously recorded from Alaska.

B. (*Micromelomalus*) species near *planiusculum* Mann. McKinley National Park (1).

B. (*M.*) *complanulum* Mann. McKinley National Park (1).

B. (*Peryphus*) *nebraskense* LeC. Fairbanks (1). Not previously recorded from Alaska.

Patrobus fossifrons Esch. Anchorage (1).

Platysma[3] (*Hypherpes*) *castaneus* Dej. Wrangell Is. (11), Juneau (6).

P. (*H.*) *amethystinus* Mann. Ketchikan (1), Wrangell Is. (2).

P. (*H.*) *algidus* LeC. Wrangell Is. (2).

P. (*H.*) *crenicollis* LeC. Wrangell Is. (3).

P. (*Cryobius*[4]) *riparius* Dej. McKinley National Park (2).

P. (*C.*) *borealis* Mén. McKinley National Park (3).

P. (*C.*) species near *macrophthalmus* Popp. from alpine Siberia. McKinley National Park (3).

P. (*C.*) *fastidiosus* Mann. McKinley National Park (2).

P. (*Bothriopterus*) *adstrictus* Esch. Wrangell Is. (1), Anchorage (8), McKinley National Park (1), Fairbanks (2).

Amara (*Curtonotus*) *infausta* LeC. (?). Fairbanks (1).

A. (*Stereocerus*) *haematopus* Dej. McKinley National Park (2).

A. (*Celia*) *remotestriata* Dej. Anchorage (3).

Calathus micropterus Duft. (*ingratus* Dej.). Anchorage (1).

Pristodactyla advena LeC. var. *lenis* Mann. Anchorage (7).

Tachycellus nigrinus Dej. Wrangell Is. (1).

DYTISCIDAE.

Agabus bicolor Kby. McKinley National Park (1 ♂). The elytra are very dark brown on the disc with paler margins in the specimen at hand. Recorded by Mannerheim (Bul. Mosc., 1852, ii, pp. 158–159) from the Kenai Peninsula.

Consequently, I propose the subgeneric name **Neonebria** to replace the *Nebria* s. str. of Ganglbauer (Kaf. Mitteleur. I, 1892, p. 99), with *Carabus lividus* L. as the type.

[3] According to Andrewes (Ann. Mag. Nat. Hist. (X) XVI, 1935, p. 21) *Platysma* Samouelle must replace both *Pterostichus* Bonelli and *Feronia* Latreille.

[4] I have made my identifications in this difficult group with the aid of B. Poppius, *Zur Kenntnis der Pterostichen-Untergattung Cryobius* Chaud. (280 pp., Helsingfors, 1906) in which keys and descriptions are given to the species of both Eurasia and North America.

A. confinis Gyll. Fairbanks (1 ♀). Recorded by Hamilton (Trans. Am. Ent. Soc., XXI, 1894, p. 14) from Sitka and Afognak Island. I have a second specimen from Bakersville in central British Columbia.

CATOPIDAE.

Catops (*Sciodrepa*) *basilaris* Say. McKinley National Park (15).

LEIODIDAE.

Leiodes spp. Two females, representing perhaps two species, from McKinley National Park.

STAPHYLINIDAE.

Olisthaerus megacephalus Zett. McKinley National Park (2).

Baptolinus macrocephalus Nord. Wrangell Is. (1).

Quedius (*Distichalius*) *marginalis* Mäkl. McKinley National Park (1). Recorded by Mannerheim (Bul. Mosc., 1852, ii, no. 56) from Sitka.

Q. (*Microsaurus*) *mesomelinus* Marsh. Wrangell Is. (1). Cited by Hamilton (Trans. Am. Ent. Soc., XXI, 1894, p. 18) from Alaska without specific locality.

Bolitobius cincticollis Say. Anchorage (1).

CANTHARIDAE.

Podabrus piniphilus Esch. McKinley National Park (4), Stikine R., B. C. (1).

P. heteronychus Fall. Anchorage (1). Described (Fall, Ent. Amer., VIII, 1927, p. 101) from Manitoba and from Homer on the Kenai Peninsula.

CLERIDAE.

Thanasimus undulatus nubilus Klug. Fairbanks (5). Previously recorded from Sitka (Hamilton, l.c., p. 30).

PYTHIDAE.

Salpingus elongatus Mann. ? Fairbanks (1). Recorded by Mannerheim (Bul. Mosc., 1852, ii, no. 134) from Sitka.

ELATERIDAE.

Ludius volitans Esch. Juneau (1).

Hypnoidus bicolor Esch. McKinley National Park (6).

H. extricatus Fall. McKinley National Park (2).

Ampedus moerens LeC. Fairbanks (1). Previously known from California to Washington.

BUPRESTIDAE.

Dicerca tenebrica Kby. (*prolongata* LeC.). Fairbanks, on poplar (14). Not previously recorded from Alaska.

D. tenebrosa Kby. Fairbanks (16).

Poecilonota cyanipes Say. Stikine River, B. C. (1 ♂). The form of the last ventral segment is far closer to that figured by Chamberlin (Jour. N. Y. Ent. Soc., XXX, 1922, pp. 56–58, pl. VII, figs. 5–8) for the typical form of the species, which he records from Maine and Texas to Alberta, than to that of his western variety, *californica,* which he records from Yukon Territory to Utah and California.

Buprestis nuttali Kby. Fairbanks (50). Not previously recorded from Alaska.

Melanophila drummondi Kby. Fairbanks (7).

Chrysobothris breviloba Fall. Fairbanks (12). Not previously recorded from Alaska.

BYRRHIDAE.

Byrrhus sp. near *difficilis* Csy. McKinley National Park (1).

COCCINELLIDAE.

Adalia frigida Schn. ab. *fasciata* Weise and ab. *hyperborea* Payk. (= *disjuncta* Rand.). One specimen of each from Fairbanks. This species has not previously been recorded from Alaska.

TENEBRIONIDAE.

Phellopsis porcata LeC. Wrangell Is. (5).

Upis ceramboides L. Anchorage (1), Fairbanks (1).

ANOBIIDAE.

Xyletinus lugubris LeC. Stikine River, B. C. (1). Recorded by Fall (Trans. Am. Ent. Soc., XXXI, 1905, p. 203) from Massachusetts to Nebraska.

SCARABAEIDAE.

Dichelonyx backii Kby. Stikine River, B. C. (1).

LUCANIDAE.

Platycerus depressus marginalis Csy. Stikine River, B. C. (1). Described from Washington. No species of this family appears to be listed from Alaska!

CERAMBYCIDAE.

Tetropium sp. near *cinnamopterum* Kby. but smaller. McKinley National Park (1).

Acmaeops pratensis Laich. Anchorage (1), McKinley National Park (1), Fairbanks (1).

Merium proteus Kby. Fairbanks (1).

Xylotrechus undulatus Say. Fairbanks (13).—ab. *interruptus* Cast. Fairbanks (1).

X. obliteratus LeC. Stikine River, B. C. (1).

Neoclytus muricatulus Kby. Fairbanks (5).

Monochamus scutellatus Say. Fairbanks (7).

CHRYSOMELIDAE.

Orsodacne atra Ahr. var. O. Hatch, N. Y. St. Coll. For. Tech. Publ. 17, 1924, p. 307. Fairbanks (1).

Adoxus obscurus villosulus Schr. Anchorage (1). Stikine River, B. C. (13).

Calligrapha multipunctata Say. Fairbanks (1). Not previously recorded from Alaska.

Chrysolina engelhardti n. sp. McKinley National Park (1).

Chrysomela interrupta Fab. var. *aenicollis* Schf. Stikine River, B. C. (5).

Altica tombacina Mann. Stikine River, B. C. (2).

CURCULIONIDAE.

Lepyrus gemellus Kby. Fairbanks (1). Recorded by Hamilton (Trans. Am. Ent. Soc., XXI, 1894, p. 34) from south central Alaska.

Chrysolina engelhardti n. sp.

Length 6.75 mm.; black, shining; spots on the mandibles, on the maxillae, on the first two or three antennal segments, and on the pro- and mesocoxae rufous; the trochanters, the femora, and the tibiae rufous except for the infuscate knees and tibial apex; head coarsely punctate, alutaceous, rugosely depressed between the smooth tubercles above the point of insertion of the antennae; antennae reaching one segment behind the base of the pronotum, the last five segments forming an elongate club; pronotum twice as wide as long, the apex about two-thirds as wide as the base, the sides broadly arcuate in front, obliquely convergent behind to the obtuse hind angles, the base broadly arcuate, nearly straight at middle, the disc alutaceous, coarsely punctate, more finely so either side of the median line, the sides thickened and set with a few coarser punctures, the lateral groove marked by a few coarser punctures, feeble, almost obsolete in front; scutellum smooth; elytra finely wrinkled, the intervals convex, the evenly numbered ones more strongly convex and smooth or with only a few coarse punctures, the odd numbered ones less convex and irregularly coarsely punctate, the striae represented by more or less regular impressed series of coarse punctures; venter shining, the thoracic side pieces coarsely punctate; hind wings present.

Type: McKinley Nat. Park, Alaska, July 5, 1938, G. P. Engelhardt (in collection of author).

This species runs to *blaisdelli* Van D. in Van Dyke's key (Bull. Brook. Ent. Soc., XXXIII, 1938, pp. 46–49), being distinguished therefrom by its uniform non-metallic shining black color, the femora and tibiae alone being rufous.

I take pleasure in dedicating this species to Mr. George P. Engelhardt, whose energy and courtesy have made this little study possible.

Note: In addition, the following beetles, determined by Mr. Donald DeLeon, were collected June 28, 1938, on logs of pine and fir at a sawmill at Fairbanks:
Ips perturbatus (Eich., 14 specimens.
I. borealis Sw., 3 specimens.
Scolytus piceae (Sw.), 2 specimens.—G. P. E.

NEOTRIOZELLA AND A NEW RELATED GENUS (HOMOPTERA: PSYLLIDAE).

By Leonard D. Tuthill, Ames, Iowa.

This group of psyllids is characterized by the peculiar genal cones and by the head, which is as broad as, or broader than, the thorax. The genal cones are quite long, slender and closely appressed throughout their length.

Key to Species

1. Genal cones longer than vertex 2
   Genal cones shorter than vertex 4
2. Body pubescent, very light colored .... **hirsuta**, n. sp.
   Body glabrous, red to brown in color 3
3. Genal cones white, slender and acute at apex .... *pyrifoliae*
   Genal cones black, rather thick .... *sculptoconus*
4. Genal cones black .... *laticeps*
   Genal cones light .... *virginiana*

Neotriozella pyrifoliae (Forbes)

1884 *Trioza pyrifoliae* Forbes, Fourteenth Report of the State Entomologist of Illinois, pp. 98-99.
1910 *Trioza immaculata* Crawford, Pomona Jour. Entomology, 2: 233.
1911 *Neotrioza immaculata* Crawford, Pomona Jour. Entomology, 3: 450.
1911 *Neotriozella immaculata* Crawford, Pomona Jour. Entomology, 3: 503.
1912 *Neotriozella ottawanensis* Patch, Maine Agr. Exp. Sta. Bull. 202: 231.

Forbes' description of this species has apparently been entirely overlooked in the literature. The original description was based upon ten specimens taken on pear at Normal, Ill., May 7, 1884. Four of these specimens are now in the Illinois Natural History Survey Museum at Urbana, Illinois. I have examined a male paratype and it is undoubtedly conspecific with *immaculata* (Crawford). Dr. H. H. Ross of the Natural History Survey has kindly compared this paratype with the lectotype* and states "they seem to agree in every particular except the color of the vertex." The name *immaculata* must be suppressed as a synonym of *pyrifoliae*. The writer designates *pyrifoliae* (Forbes) as the genotype of the genus *Neotriozella* Crawford.

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* The lectotype was designated by Dr. T. H. Frison, Bull. Ill. State Nat. Hist. Survey, vol. 16, article IV, p. 154.

Neotriozella hirsuta n. sp.

Resembling *Neotriozella pyrifoliae* (Forbes) but lighter in color, head more massive, vertex and dorsum of thorax pubescent; male proctiger with a large posterior lobe, forceps acute at apices. Length to tip of folded wings 3 mm.

Color: General color yellowish white, eyes, lower edge of margin of vertex, tips of antennal segments and tarsi dark; prescutum and scutum with yellow stripes. Wings hyaline.

Structure: Head, thoracic dorsum, legs and genital segments with sparse, rather long, silky pubescence. Head large, as wide as thorax. Anterior margin of vertex very abrupt and protruding, disc distinctly concave. Genal cones longer than vertex, closely appressed, rather thick, moderately acute at apex. Antennae about one and one half times as long as width of head. Thorax strongly arched. Fore wings about three times as long as wide.

Genitalia: Male genitalia moderate in size, covered with very long, fine pubescence. Proctiger greatly produced caudad into enveloping posterior lobes. Forceps as long as proctiger; from lateral aspect broadest at base, strongly curved caudad to acute black apices; from caudal aspect evenly incurved, broadest before apex, inner anterior margin produced medially into a blunt black margined tooth.

Female genital segment rather short, quite suddenly narrowed to black tip, dorsal valve longer than ventral, apices of valves broad and flat.

Holotype (male) and *allotype* (female) Baboquivari Mts., Ariz., April 3, 1937, W. Benedict, in Snow Entomological Collection, University of Kansas, Lawrence, Kansas.

Neotriozella sculptoconus Crawford

This species was described by Crawford from two males from California. I have at hand a female which has been compared with the type and is here designated as the allotype. The female genital segment which is very similar to that of *pyrifoliae* is almost as long as the rest of the abdomen, very slender and acute. The dorsal valve is black tipped, longer than ventral.

Allotype (female), Big Bear Lake, California, July 26, 1932,

R. H. Beamer, Snow Entomological Collection, University of Kansas.

Neotriozella laticeps (Crawford)

This species is known only from the female type from Louisiana.

Neotriozella virginiana Caldwell

I have not seen this species which was recently described from a single female specimen collected in Ohio.

Metatrioza, n. gen.

Head large, at least as broad as thorax. Vertex with sharp anterior and posterior margins, strongly concave between eyes, the medial suture prominent. Genal cones not contiguous. Clypeus very small. Dorsum of thorax rather broad and flat, pronotum not depressed below head. Fore wings with typical triozine venation, except second marginal cell which is unusually large. Hind tibiae with two inner apical spines.

Type of genus **Metatrioza pubescens,** n. sp.

In width of head and venation of wings this genus resembles *Neotriozella* Crawford but the genal cones are utterly different from those of that genus. It resembles *Trioza* in a great many features but the massive head, concave vertex with sharp margins and the broad, comparatively flat thorax distinguish it from this genus.

Metatrioza pubescens, n. sp.

Length to tip of folded wings 4 mm.

Color: General color reddish brown, genal cones, pronotum and posterior portion of vertex yellow, venter and antennae dark. Fore wings hyaline, hind wings more or less white.

Structure: Body finely punctate, clothed with a short, fine pubescence, including veins of fore wings, pubescence most prominent on genital segments, legs and antennae. Head very large, as wide as thorax, three times as wide as long in dorsal view. Vertex sharply margined both anteriorly and posteriorly, disc deeply depressed, the medial suture very prominent. Anterior ocellus usually large, beneath overhanging margin of vertex. Frons visible as a distinct sclerite, not covered by genal cones, the latter not contiguous, short, one half as long as disc of vertex, slightly divergent, rather blunt.

Clypeus very small, entirely invisible from front. Antennae slightly over twice as long as width of head. Pronotum not depressed below level of head, episterna strongly produced. Prescutum not very strongly arched, about one and two-thirds times as wide as long. Fore wings acute at apex, three times as long as wide, veins prominently pubescent, marginal cells large, the second larger than first. Venation of hind wings unusually prominent. Hind tibiae with two inner and one outer apical spines.

Genitalia: Male genitalia of moderate size. Proctiger longer than forceps, almost equilaterally triangular in outline, broadest near base, truncate at apex. Forceps simple, in caudal view somewhat broader at base, slightly bowed, apices blunt, with a very small medial black tooth. Female genitalia quite large, about three-fourths as long as remainder of abdomen, dorsal valve longer than ventral.

Holotype (male), *allotype* (female), 21 male and 17 female paratypes, Baboquivari Mts., Arizona, April 3, 1937, W. Benedict. Holotype, allotype and paratypes in Snow Entomological Collection, University of Kansas, paratypes in author's collection.

A Rare Hymenopteran.—The Ampulicid, *Rhinopsis caniculata* (Say), to the best of Dr. J. C. Bradley's knowledge has been collected only singly and then very rarely, and there seems to be very little ecological data.

The insects were collected at Englewood Cliffs, New Jersey, just about 500 yards north of the entrance to the Dyckman Street Ferry slip atop the Palisades and not more than 200 yards from the cliff edge. The area is covered with a diverse Austral vegetation but the largest trees are Red and White Oaks. The Ampulicids were found on the large trunks of recently-dead trees, intermittently running and flying rapidly over the surface of the trunks and poking their heads into every crevice, twitching wings nervously and, in general, acting similarly to typical Spider Wasps but being persistently found on the sunny sides of the trees in the vicinity. They were found during the 29 and 30 of June whereas the only two N. Y. records are one specimen each on August 3 and September 4.—Ezra M. Greenspan, Ithaca, N. Y.

A NEW ANISOSTENA (COLEOPTERA: CHRYSOMELIDAE) FROM OWENS VALLEY, CALIFORNIA.

By Burdette E. White,
University of California, Berkeley, Calif.

Among the many interesting specimens taken by the Entomolgy field class of 1937, under the supervision of Dr. E. C. Van Dyke, were two *Anisostena* of the sub-family Hispinae. These represent a new species which is described below.

Anisostena mitchelli n. sp.

Elongate, subcylindric, brown, the pronotum rufous. Front of head with a median groove extending down to antennal sockets, a few rather coarse, irregularly placed punctures above the antennae and between the eyes, the apical margin of the labrum produced to form a median cusp-like process; antennae as long as the head and pronotum together, 3rd segment longer than the 2nd or 4th but narrower, 4th, 5th, and 6th segments gradually widening, the remaining segments forming an elongate, fusiform, sparsely pubescent club; pronotum distinctly longer than broad, sides parallel, the disk sparsely, coarsely punctured, the sides more densely so, the area between the punctures rather smooth and shining; elytra about one third wider at the base than the pronotum and three and one half times as long, the sides parallel, each elytron tricostate, a double row of punctures in each costal interspace and between the suture and 1st costa, the punctures large and nearly confluent, the 1st and 3rd costae united near the apex, the median costa terminating abruptly before the union of the 1st and 3rd, the lateral margin sinuate anteriorly when viewed from the side, regularly rounded to the apex; underneath in large part smooth and polished shining, brown, femora and tibiae lighter —rufous, the tarsi darker—brown.

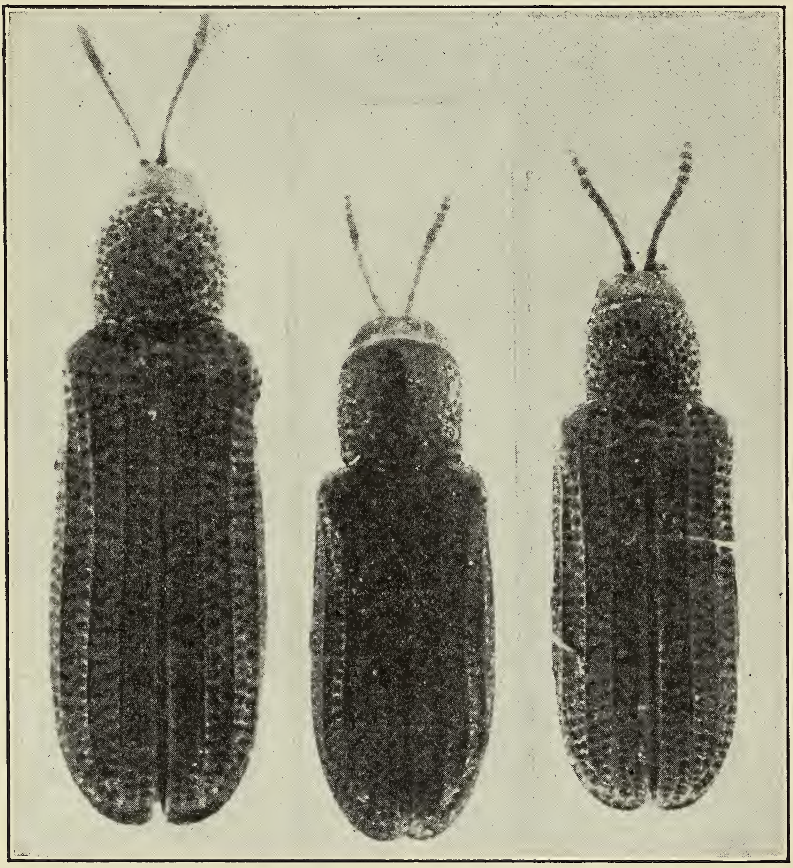
Size: 4.5 mm. long; 1.5 mm. wide.

Type locality: Lone Pine, Owens Valley, California.

Holotype 4759 in California Academy of Science Collection, taken at Lone Pine, California; paratype in author's collection, collected at Independence, California.

A. mitchelli is quite distinct from any other species in our fauna. It is completely different from *californica* Van Dyke which is the only other species of the genus recorded from California. *Cali-*

fornica is black with metallic blue elytra and pronotum, and is much more coarsely punctured than the brown *mitchelli* (See figure). *A. perspicua,* an Arizona species, is similar to *californica* but larger. The photographs were taken by Dr. Roderick Craig.



perspicua. *mitchelli.* *californica.*

It is with great pleasure that I name this distinctive species after Mr. J. H. Mitchel of Oxnard, California, who collected and presented the Independence specimen used in this description.

UNKIND WORDS ON INSECT DESCRIPTIONS.

By J. R. de la Torre-Bueno,
Tucson, Ariz.

> "The time has come," the Walrus said,
> "To speak of many things;
> Of shoes and ships and sealing wax,
> Of cabbages and kings."
> (*Alice in Wonderland.*[1])

We speak of bugs and how they are described.

We begin with the archaic early descriptions, notable for economy in words and parsimony in structure, albeit for extravagance in color. These puzzles may be solved either by consensus of opinion or by examination of types, or by arduous, heartbreaking and always discouraging labor. And the tradition still seems to linger unabated.

We go on to the more modern and longer descriptions now current, which are sometimes diffuse and not always enlightening.

These descriptions are gradually becoming more and more structural. Some authors, to their great credit, now favor us with a two-part description—a purely structural part and a color picture, the one supporting the other.

In a structural description, each and every part and structure becomes valid as an element in the picture. Hence, internal as well as external structures may be used, and are used, to characterize a form. But sometimes these are too abstruse and subtle for everyday use.

It seems to the writer that structures naturally fall into two categories: the one, all structures, internal and external, which go to establish a discrete entity, the species; the other, what we may call recognition characters, that is, those outstanding readily seen structures which may be set dichotomously one against another, and which serve to differentiate forms.

Among these recognition characters are numbered: length and proportion of antennal and tarsal segments; visible abdominal segments, their sculpture, vestiture, etc.; proportions of head, thorax, scutellum and abdomen, relative to each other and within themselves; proportion and structure of leg segments; and *always* length and breadth of the insect. Incredible though it appear, the writer has run across recent descriptions in which size was omitted!

---

[1] Recommended reading for entomologists—particularly for descriptive entomologists.

This is a plea for some sort of coördination and correlation in descriptions, for standardized patterns, if you please. It is also an urgent plea for the use of characters which do not call for dismembering of specimens, frequently not our own and not seldom uniques; a plea for selection of *visible,* clean-cut external characters, without subtleties of curves, *not* for selection of concealed parts, such as embedded genitalic structures, going so far as ovaries and testes—not that these are not true and valid characters. A true extension of this last would take us—and legitimately, on the premises—to structure, form and motility of spermatozoa and into chromosome counts, and even into cytology. Ridiculous? Not at all—there is not one of these things which is not an integral constituent and a necessary element of the entity we term a species.

But in the general description we should restrict ourselves to a definite number of characters, perfectly visible, obvious and understandable ones, characters evident without a dissection, partial or total. How many entomologists realize that a consensus of, say, *ten* characters varying three ways, by combination and recombination, will afford a means of differentiating well over 50,000 species? Ask any competent mathematician to verify this.

Of course, each individual group has its own key characters, but these should be coextensive with the group. They need not even apply to another genus.

If entomologists were to agree by common consent on some pattern, as has been done in the Miridae, for instance, we would progress much faster and clear the land of much miscellaneous flotsam and jetsam.

By no means do we advocate a procrustean bed; because after all, there *is* progress; but we do advocate the promotion of progress by doing away with the deadening (and deadly) labor of trying to find out what was meant by some one who in substance said nothing.

In this view, a proper description would fall into three parts: a description proper, in which the author could write his heart out and display his erudition, using everything he wanted to, even to the contractile cell vacuoles (if he could get anyone to print it); a diagnosis, in which visible, clean-cut characters, variable or invariable, including size, should be used in sufficient number clearly to differentiate the species described from *any other* in the group, and even from species still to be discovered, which characters should be at least four, and preferably a larger number, say eight or ten; and finally, a color picture, where needed or called for.

Particularly, describers should always remember that the basic purpose of a description is to inform some one who had never seen the species.

A KEY TO THE NEW WORLD AMPHICROSSUS ERICHSON (NITIDULIDAE).

By C. T. Parsons,

Biological Laboratories, Harvard University.

Amphicrossus Erichson, 1843, in Germar, Zeitschr. Ent., 4: 346.
Lobostoma Fairmaire, 1892, Rev. d'Ent., 11: 90.
Rhacostoma Berg, 1898, Com. Mus. Buenos Aires, 1: 98.

Amphicrossus is absent from Europe, its center of distribution lying in eastern Asia. Therefore the few rare American forms probably have developed from ancestors that arrived via eastern Siberia and Alaska. Apparently all the species feed on sap.

In the males there is a small additional segment visible from beneath, and in some species a pencil of setae on each elytron at or near the suture at its middle.

A. insularis Grouvelle was wrongly cited by Leng and Mutchler (1914, Bull. Amer. Mus. Nat. Hist., 33: 421) as occurring on the island of St. Thomas in the West Indies, since it was described from San Thomé (St. Thomas Island) 200 miles off the coast of French Equatorial Africa. Therefore it is omitted from the following key:

1. Pygidium without a black longitudinal line .... 2.
   Pygidium with a black longitudinal line .... *lateralis* Er.
2. Hind angles of pronotum very broadly rounded .... 3.
   Hind angles of pronotum narrowly rounded .... 4.
3. Males with the two pencils of setae on the sutural margin of each elytron, so that they touch almost all the way to their tips .... *limbatus* Sharp.
   Males with the two pencils of setae on the disc of each elytron farther apart, so that they could touch only at their tips .... *ciliatus* Olivier.
4. Margins of elytra with broad fringe of hair; pencil of setae present on each elytron in the male .... *horni* Sharp.
   Margins of elytra with narrow fringe of hair; pencil of setae absent from each elytron in the male ...... *niger* Horn.

Amphicrossus lateralis Erichson

Amphicrossus lateralis Erichson, 1843, in Germar, Zeitschr. Ent., 4: 348.

This, the only South American species, is unknown to me. Erichson described it from Pará, Brazil, and states that it is related to *ciliatus*. If the key character does not prove to be constant, the locality should help to distinguish this species.

Amphicrossus limbatus Sharp

Amphicrossus limbatus Sharp, 1889, Biol. Centr.-Amer., vol. 2, pt. 1, p. 349.

This species is still known only from the type pair collected in Guatemala.

Amphicrossus ciliatus (Olivier)

Amphicrossus ciliatus Olivier (*Nitidula*), 1811, Encycl. meth., 8: 210.

Amphicrossus (?) *unilineatus* Say (*Nitidula*), 1825, Journ. Acad. Philadelphia, 5: 182.

This species extends from Ontario to Florida, Cuba, and Panamá, west to Texas, Missouri, and Iowa. The Panamá record is based on a specimen in the U.S.N.M. collected by Schwarz, Jan. 3, at Old Panamá. In the same museum is a specimen Schwarz collected, Jan. 22, at Cayamas, Cuba.

Amphicrossus horni Sharp

Amphicrossus horni Sharp, 1889, Biol. Centr.-Amer., vol. 2, pt. 1, p. 349.

This species is still known only from the type series collected in Guatemala.

Amphicrossus niger Horn

Amphicrossus niger Horn, 1879, Trans. Amer. Ent. Soc., 7: 317.

This rare species differs from *ciliatus* in being fuscous above (not black as Horn says), unicolorous, having more parallel sides, much narrower elytral fringe of hair, and in lacking the pencil of setae near the sutural margin of each elytron.

Of *niger* there are three specimens (one a cotype in the Leconte collection) in the Museum of Comparative Zoology, three in the Philadelphia Academy of Sciences (cotypes) and one in the British Museum: all labelled "Ariz." There is also a specimen in the Van Dyke collection of the California Academy of Sciences from the San Pedro River, Fairbanks, Arizona, Sept. 6 and one from Tucson, Ariz., Aug. 16, in the University of Kansas collection.

The writer is greatly indebted to the various curators for the privilege of examining material and particularly to Mr. Hugh Scott for notes on the types in the British Museum.

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BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXXIV April, 1939 No. 2

NEW GENERA AND SPECIES OF MUSCOID DIPTERA.[1]

By H. J. Reinhard, College Station, Texas.

The following descriptions of new North American genera and species, with notes on several previously described forms, are based upon material from several different sources, which are mentioned below. Types of the new species, unless otherwise stated, are in my collection.

Genus *Emblemasoma* Aldrich.

Emblemasoma Aldrich, Sarcophaga and Allies, 1916, p. 56.

The genotype is *E. erro,* described as new, from three male specimens from the United States and Brazil. The only other species hitherto known is *faciale,* described on page 58 of the above reference. The outstanding generic characters may be briefly listed as follows: clypeus much narrowed below by the approximated vibrissal angles; vibrissae situated the length of second antennal segment above the oral margin; and the cheek unusually wide, equal to one-half the eye height. The long plumose arista at once distinguishes the genus from *Macronichia,* which has about the same combination of cephalic characters. The female sex, known only in one species, does not have the genitalia adapted for piercing. Members of the genus are apparently uncommon and little seems known concerning the biology or reproductive habits. The following key will assist in distinguishing the present species.

Key to Species of Emblemasoma.

1. Cheeks clothed with black hairs 2

Cheeks wholly pale-haired; sides of front and face golden pollinose, facial depression and lower edge of cheek gray;

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[1] Contribution No. 464 from the Division of Entomology, Texas Agricultural Experiment Station.

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palpi yellow; legs black; female only (South Dakota). **albicoma,** n. sp.

2. Palpi, legs and antennae black 3
   Palpi, legs and antennae yellow; male only (Georgia). *faciale* Aldrich.
3. Prosternum widened and somewhat inflated on anterior border; calypters infuscated; inner forceps of male slender in profile, with a barb-like projection on hind surface beyond middle; male only (Kansas, Oklahoma, New Jersey, Brazil) .... *erro* Aldrich.
   Prosternum normal in size and shape; calypters whitish; inner forceps of male rather thick in profile, the hind edge straight nearly to apex, thence sloping sharply forward to an acute tip; male only (Texas) .... **sternalis,** n. sp.

Emblemasoma sternalis, n. sp.

Male.—Front (before triangle) 0.23 of the head width, moderately prominent at base of antennae in profile; parafrontals and parafacials with satiny yellowish pollen becoming grayish on cheeks; median vitta dark brown, wider than one parafrontal; frontal bristles in a single row diverging beneath antennal base to about the middle of second segment; antennae extending three-fourths the distance to vibrissae, black, third segment obscurely reddish, nearly twice as long as second; arista long plumose; parafacial beset with black hairs which become coarser on lower extremity; vibrissae situated the length of second antennal segment above oral margin; proboscis short and stout; palpi black; cheek about one-half the eye height, clothed with black hairs; eyes bare, descending nearly to level of vibrissae; back of head gray pollinose, with coarse black hairs above and pale or whitish pile on lower part.

Thorax black, gray pollinose with three to five black dorsal vittae; presutural acrostichal bristles not differentiated; prescutellar pair moderatly large; dorsocentral 3, 4; presutural 1 (outer); posthumeral 2; humeral 3; notopleural 4; intraalar 3 (anterior one small); supraalar 3; postalar 2; sternopleural 2, 1; scutellum with 2 lateral, 1 preapical and 1 decussate apical pair; calypters opaque white, hind lobes faintly brownish at middle; propleura bare; prosternum thinly pilose on outer margin behind.

Abdomen black except fourth segment which is wholly red, gray pollinose with three black dorsal vittae, the outer ones shifting or changeable with the angle of view; proximal segments with only lateral bristles; third and fourth segment each with a complete marginal row; genital segments red, sparsely clothed with fine black hairs above; forceps brownish, rather flat behind with a shallow median groove, hardly at all tapering outward, the tips pointed and separated by a broad U-shaped apical incision; accessory plate small and rather inconspicuous; claspers short, both pairs strongly bowed forward; penis rather slender from base outward, apical segment suddenly enlarged at tip which bears a pair of short incurved plates at the posterior extremity and a longer more slender pair on the anterior apical edge directed obliquely inward; fifth sternite red, broadly incised, inner margin of lobes beset with short black hairs.

Legs black; mid tibia with two anterodorsal bristles; mid and hind femora each bearing two rows of long bristles on lower edge; hind tibia not villous; claws and pulvilli elongate.

Wings gray hyaline; veins brownish to yellow, the first bare, third setulose over half way to small cross vein; first posterior cell open far before wing tip; costal spine small; epaulets blackish.

Length: 12.5 mm.

Holotype: Male, Donna, Texas, May 18, 1932. Paratype, one male, same data as holotype.

Emblemasoma albicoma, n. sp.

Female.—Front at vertex 0.28 of the head width (average of two specimens); parafrontals and parafacials golden pollinose and clothed with mostly pale hairs; frontal vitta wide, brown covered with a whitish bloom in most views; frontal bristles of moderate size, diverging beneath antennal base to middle of second segment; ocellars rather weak, proclinate; inner verticals stout but not very long, outer ones hardly differentiated; orbitals two proclinate pairs; antennae wholly bright yellow, reaching a little below middle of face, third segment about one and one-half times longer than second; arista brownish, long plumose to middle; facial depression gray pollinose, considerably narrowed at the vibrissal angles, which are well above the oral margin; proboscis short, palpi reddish, slightly thickened apically and beset with black bristly hairs; cheek fully three-fourths the eye height, golden pollinose becoming gray below, clothed with soft pale hairs; eyes bare; back of head gray, with two irregular rows of postocular cilia, the hairs below finer and pale in color.

Thorax black with cinereous pollen, which is interrupted above by three to five black vittae; pleura and humeri with pale hairs. Chaetotaxy as in *sternalis,* but the inner presutural is developed and the scutellum bears three lateral, one discal, but no apical pair of bristles; propleura bare; prosternum with a few fine hairs at sides behind; calypters opaque, white with a slight brownish tinge at middle of hind lobes.

Abdomen black, cinereous pollinose with three rather broad but changeable black vittae; basal segments with only lateral bristles; third and fourth segments each bearing a row of rather weak marginals, the latter segment red on the narrow apical margin; genital segments red, the first tubular with second much smaller and retracted; genitalia terminating in a blunt-tipped organ, bearing numerous long wavy black hairs before apex on each side.

Wings hyaline; first vein bare, third with setae extending half way to small cross vein; first posterior cell open well before extreme wing tip; costal spine small; epaulets red.

Legs black with the basal segments and knees reddish, femora and tibiae gray pollinose; mid tibia with two anterodorsal bristles; mid femur bearing two ventral rows of bristles which become hairlike beyond the middle; claws and pulvilli somewhat shorter than apical tarsal segment.

Length: 9 to 10 mm.

Holotype: Female, Custer, South Dakota, July 21, 1933 (F. R. Bingham), in the S. D. State College Collection. Paratype, one female, same data as holotype.

Sarcophaga ramosa, n. sp.

Male.—Front narrowed before triangle, 0.19 of the head width (average of two specimens); parafrontal and parafacial gray to yellowish gray with a row of minute hairs on outer margin extending from vertex nearly to cheek, lower ones slightly longer but not bristly; inner verticals long and reclinate, outer ones not developed; ocellars rather weak, but distinct; frontals in a single row, moderately divergent beneath antennal base, descending to middle of second segment; frontal vitta dark brown, wider than one parafrontal; antennae black, a trifle shorter than face, third segment rather slender and fully three times longer than second; arista long plumose as usual, brownish black; face gray pollinose, moderately excavated with lower edge slightly produced as viewed from the side; vibrissae a little approximated, situated just above level of oral margin; proboscis short and stout; palpi black, slightly upturned and thickened beyond the middle; eyes bare, descending almost to vibrissae; cheek gray pollinose, clothed with black hairs, about one-fourth the eye height; back of head gray pollinose, with two rows of postocular cilia and longer pale hairs on lower part.

Thorax black, gray pollinose marked with the usual three to five black vittae above; presutural acrostichal bristles small or barely differentiated, the prescutellar pair distinct; dorsocentral 3, 4; notopleural 4; sternopleural 2, 1; scutellum with 3 lateral (median one small), and 1 preapical, the apical pair lacking; propleura bare; prosternum finely haired at sides; calypters white with a uniform brownish tinge.

Abdomen dusted with pale yellowish gray pollen, which is interrupted above by three changeable black vittae; anal segment rather broadly reddish, the preceding ones black; segments one and two without median marginals; third and fourth bearing a marginal row, the bristles rather widely spaced on former; genital segments red, pollinose on upper surface, the first with a marginal row of about ten bristly hairs; forceps yellow, thin in profile with a minute barblike projection near apex behind, in rear view tapering outward from a broadish base to rather blunt tips separated by a shallow U-shaped incision; penis red, rather short with the apex swollen and somewhat curved forward, bearing a pair of moderate-sized plates on front side near middle, between which arises a rather striking slender and asymmetrically branched appendage beset with flattened or scale-like setae on the smaller rami; accessory plate small, triangular; posterior claspers slender, curved forward at the extreme tip; anterior claspers laterally compressed or broad in profile, bowed forward from near base and hardly at all tapering outward; fifth sternite with a broad U-shaped incision, the lobes red and clothed with longish fine black hairs.

Legs black; middle femur with comb and the middle tibia with one anterodorsal bristle; hind tibia not villous; claws and pulvilli normally elongate.

Wings gray hyaline; first vein bare, third setulose near base; first posterior cell open well before wing tip; costal spine vestigial; epaulets blackish.

Length: 9 to 10 mm.

Holotype: Male, Donna, Texas, May 18, 1932. Paratypes:

one male same data as holotype and one male labeled Hidalgo County, Texas, April 2, 1932.

The species belongs to Aldrich's group H and traces to *S. galeata* in the key, but it is at once distinguished by the distinctive genital characters in the male.

Sarcophaga comparilis, n. sp.

Male.—Like the preceding species but the genitalia showing distinct differences and the front somewhat narrower; latter before triangle 0.15 of the head width; genital segments of ordinary size, red, the first bearing a marginal row of slender bristles; forceps yellow, viewed from side rather thin and slightly sinuate, the narrow blackish tip obliquely truncate, viewed from behind broadish at base gradually tapering apically, divided beyond middle but contiguous to apex; penis rather short, apex rounded but not much enlarged, near middle on front side with a pair of short subglobular lobes which become flattened distally and bear two slender symmetrical hooklike appendages; accessory plate yellow, rather large, subovate; claspers reddish yellow, ordinary in length; hind pair narrow, slightly tortulose near tip which is turned forward; anterior pair broader, curved near middle, tapering to sharp apex; fifth sternite not prominent, narrowly but deeply incised, the lobes reddish yellow, beset with fine black hairs on posterior margin.

Length: 9.5 mm.

Holotype: Male, Donna, Texas, May 18, 1932. Paratype: one male, same data as holotype.

In Aldrich's key to Group H, the present species traces to *S. culminata,* from which it differs in the male genitalia and the paler or grayish yellow pollen on the parafrontals, parafacials, and cheek.

GENUS *Opsotheresia* TOWNSEND.

Opsotheresia Townsend, Proc. U. S. N. M., Vol. 56, 1919, p. 552

The type and sole original species is *O. obesa,* described as new, from a single male specimen collected by W. L. McAtee in Maryland. The high facial carina, setose propleura and the slender, somewhat elongate proboscis are outstanding characters. Townsend states that the first two abdominal segments lack median marginal bristles and cites this as one of the essential items to distinguish the genus from the related forms included in his recently published key to Theresiini (Manual of Myiology, Part III, pp. 146–8). As stated the male lacks median marginals, but there is a well developed pair on the second abdominal segment in the female sex which therefore does not run to the proper couplet in the key. It may also be noted that the hind tibiae in the female are not ciliate as in the male and that the number of sternopleurals is variable; normally there are three, but sometimes four, as in the holotype.

Opsotheresia nigricornis, n. sp.

A robust species like the genotype, *O. obesa,* but differs as follows: third antennal segment wholly black; apical segment of proboscis longer, almost equal the height of head; second abdominal segment in both sexes with a pair of median marginal bristles.

Male.—Front narrowed before triangle (0.12 of the head width), widening rapidly on lower two-thirds; parafrontal gray pollinose greatly narrowed on upper half and rather sparsely black-haired; frontal vitta deep brown, broad on anterior extremity; frontal bristles in a single row stopping at base of antennae, rather weak and becoming hairlike near vertex; inner verticals moderately developed, outer ones vestigial; ocellars strongly proclinate but hardly at all divergent; antennae extending well below middle of face, basal segments obscurely reddish, third segment about twice the length of second; arista thickened at base, plumose nearly to tip, proximal segments short; parafacial bare, gray pollinose, not narrowed downward and the width about equal the length of third antennal segment; face with a strong high median carina, epistoma moderately prominent in profile; vibrissae strong, well above oral margin; palpi yellow, slender with the extreme tip slightly thickened; cheek reddish, thinly gray pollinose, black-haired below, about one-half the eye height; eyes bare; back of head beset with pale hairs.

Thorax black, thinly gray pollinose, marked with three changeable wide black dorsal vittae; scutellum blackish tinged with red beyond middle, bearing two large lateral and a somewhat weaker decussate apical pair; acrostichal 2,2; dorsocentral 4,4; posthumeral 2; presutural 1 (outer); intraalar 3 (anterior one small and far behind suture); supraalar 3; postalar 2; sternopleural 2, 1; pteropleural bristle smaller than sternopleurals; hypopleural row bordered in front with numerous long bristly hairs; propleura setose; prosternum bare; calypters opaque, white, lower lobes large.

Abdomen reddish on sides, this color expanding apically from basal segment to include the hind margin of third and all of fourth, venter and middle area of three proximal segments above blackish, thinly dusted with changeable white pollen which shows no pattern but appears denser in a flat rear view; first segment without median marginals, third and fourth each bearing a marginal row; no discals even on anal segment; genital segments red, forceps darker; fifth sternite rather prominent and deeply incised.

Legs black, moderately long; hind tibia ciliate; claws and pulvilli exceeding length of apical tarsal segment.

Wings subhyaline; bend of fourth vein rounded without stump or fold; first posterior cell open shortly before extreme wing tip; first vein bare, third setulose at base; hind cross vein joining fourth about two-fifths the distance from bend to small cross vein; last section of fifth vein short; epaulets blackish; costal spine not developed.

Female.—Front at vertex 0.30 of the head width, widening gradually downward; two proclinate orbitals and outer verticals of normal size; ocellars larger than in male and strongly divergent; third antennal segment two and one-half times length of second; abdomen black except the narrow hind margin of third and most of fourth segment which are red; anal orifice large and rounded, genital segments red, retracted, not adapted for piercing; hind tibiae not ciliated, claws and pulvilli short; wings brownish on costal margin; bend of fourth vein angular, bearing a short stump.

Length: Male, 12.5 mm.; female, 13 mm.

Holotype.—Male, Madison, Wisconsin, June 25, 1937, no collector's label. Allotype, female, labeled "Iowa, July 7, 1932."

Clastoneuriopsis, n. g.

Male only. Differs from *Clastoneura* in having two pairs of frontals below base of antennae; third vein setulose at base; last section of fifth vein less than half the length of preceding section; vibrissae well differentiated.

Head subquadrate, frontal profile nearly one-third longer than facial, oral margin and antennal axes subequal, posterior surface flat beset with only black hairs. Frontal bristles rather weak, in a single row stopping shortly before triangle; verticals hardly differentiated; ocellars long, proclinate but not divergent. Face moderately receding, epistoma moderately protuberant; vibrissae well above oral margin; facial ridges not prominent, strongly divergent downward and bearing only a few hairs on lower extremity; parafacial bare, fully half as wide as facial depression. Antennae originating far below middle of eye, third segment a trifle longer than second; arista bare, longer than antennae, basal segments short but distinct. Eyes bare. Proboscis moderately slender but a little shorter than height of head; palpi small and slender to tip. Cheek one-half the eye height. Thoracic chaetotaxy: humeral 2; posthumeral 1; notopleural 2; presutural 2 (inner one small); acrostichal 1,1; dorsocentral 2,3; intraalar 2; supraalar 1; pteropleural 1 (small); sternopleural 1,1; scutellum with two long lateral and a large decussate apical pair; infrascutellum normally developed. Propleura and prosternum bare. Abdomen rather narrow and somewhat arched above; intermediate segments each with a pair of long suberect discals; median marginals on first segment small and sometimes wanting; anal segment beset with irregular rows of good-sized bristles on apical half above. Legs moderately stout, hind tibiae not ciliate. Wings normal in shape; first posterior cell closed, petiole one-half to two-thirds the length of apical cross vein which joins the third well beyond tip of second vein; first vein bare; costal spine small but distinct.

Genotype.—**Clastoneuriopsis meralis,** n. sp.

Clastoneuriopsis meralis, n. sp.

Male.—Front narrowed before triangle (0.12 to 0.15 of the head width), widening rapidly on lower two-thirds and prominent in profile; frontal vitta brownish, narrowed above to width of anterior ocellus; parafrontal bare, with subshining cinereous pollen which extends down on parafacial and cheek; antennae reaching about to lower fourth of face, black with second segment showing a reddish tinge near apex; arista black, thickened on basal fourth; palpi brownish, short, bearing a few long hairs near tip; cheek beset with black hairs which become somewhat coarser along upper margin.

Thorax black with rather uniform cinereous pollen which appears thinner on mesonotum when viewed in a flat rear angle, no defined dorsal vittae; scutellum black, lightly dusted with gray pollen and in some views almost shining; calypters white.

Abdomen black, last three segments largely covered with gray pollen which when viewed from behind appears thinner on the broad outer margins of segments two and three, apex of fourth more distinctly shining; first segment subshining, the median marginals variable (three specimens with a distinct pair and three without any) ; discal and marginal bristles on following segments about of equal size and length; genitalia black; inner forceps united, tapering evenly to tip; outer forceps shining brown, the basal three-fourths apparently united along the anterior margin of inner forceps, the narrow apex free and slightly bowed backward over tip of inner pair; penis geniculate near middle, slender, apical segment whitish beyond middle; fifth sternite rather prominent, deeply incised.

Legs black; hind tibia with four to six good-sized widely spaced bristles on outer posterior edge; mid tibia usually with two smaller bristles on outer front side near middle; claws and pulvilli elongate.

Wings grayish hyaline; bend of fourth vein without stump or fold; hind cross vein joining third a trifle nearer bend than small cross vein; epaulets blackish.

Length: 4.5 to 5.5 mm. Female unknown.

Holotype.—Male, Vantage, Washington, April 1, 1933 (C. H. Martin). Paratypes, five specimens as follows: one, same data as holotype; three same data as holotype and one, Moses Coulee, Washington, April 3, 1933 (J. Wilcox).

Philocalia, n. g.

A small wholly yellow fly with the fourth vein evanescent beyond the bend and at once distinguished from other genera possessing this peculiar wing venation by the slender bowed proboscis which nearly equals the combined length of thorax and abdomen.

Female only.—Head wider than high strongly bulged or convex behind, frontal profile distinctly shorter than facial, antennal axis far above middle of eye and hardly longer than vibrissal axis. Frontal bristles in a single row descending to apex of second antennal segment; inner verticals rather stout and erect, outer ones considerably smaller and bowed outwardly; proclinate orbitals two pairs, rather small; ocellars larger, proclinate and strongly divergent. Eyes bare, descending to level of vibrissae. Antennae nearly as long as face, third segment about two and one-half times length of second; arista micro-pubescent, basal segment very short, second about three times longer than wide. Face moderately depressed, its ridges rather flat and bare, epistoma prominent or protuberant in profile; vibrissae large, decussate, situated on oral margin; parafacial bare. Cheek about one-fourth the eye height. Proboscis broadly bowed backward near basal third of apical segment, labella divided, small; palpi slender, a trifle thickened at tip. Thoracic chaetotaxy: dorsocentral 2,3; acrostichal 2,1 (all small); humeral 3; posthumeral 1; presutural 1 (outer); notopleural 2; intraalar 3; supraalar 3; postalar 2; sternopleural 2,1; hypopleural 5 or 6; pteropleural 1 (small); scutellum with two strong lateral, a weak discal and a hairlike apical pair; infrascutellum normal in size; propleura and prosternum bare. Abdomen somewhat flattened above, wider than thorax; intermediate segments without discals; second segment with a median marginal pair, third and fourth each bearing a marginal row; genitalia without a piercer. Legs rather long and slender, weakly bristled; claws and pulvilli minute. Wings extending beyond tip of abdomen and rather wide; third vein setulose at base, joining costa slightly above extreme wing tip; last section of fifth vein half as long as the preceding section; costal spine small.

Genotype.—**Philocalia tenuirostris**, n. sp.

Philocalia tenuirostris, n. sp.

Female.—Front at vertex 0.40 of the head width and hardly any wider at anterior extremity; parafrontals, parafacials and cheeks gray pollinose on yellow ground color; frontal vitta deep yellow, wider than one parafrontal on upper half; antennae yellow, third segment infuscated near apex on outer side; arista thickened and yellow on basal fourth, brownish and slender beyond; parafacial narrowed below to about one-third the width of third antennal segment; cheek bare on upper half; palpi yellow, beset with minute black stubby hairs; back of head dark and clothed with black hairs on upper half, yellowish with pale or white hairs below.

Thorax and scutellum wholly yellow, lightly dusted with white pollen; notum showing four poorly defined vittae before the suture, only the outer pair apparent behind; calypters tawny, semitransparent.

Abdomen reddish yellow paler and translucent basally, subshining except the narrow basal margin of intermediate segments, which are white pollinose; fourth segment without discals; anal orifice rounded, genitalia retracted.

Legs yellow, tarsi dark brown to blackish; mid tibia with one small bristle near middle on outer front side; hind tibia bearing two weak bristles on outer posterior edge; front tarsus about one and one-half times longer than tibia.

Wings subhyaline with a faint yellowish tinge; veins including costa and epaulets pale yellow.

Length: 6 mm.

Holotype.—Female, Bozeman, Montana, July 18, 1936 (H. B. Hoeffler).

GENUS *Siphoclytia* TOWNSEND.

Siphoclytia Townsend, Trans. Am. Ent. Soc., vol. 19, 1892, pp. 116–17. Male only; type and sole species, *robertsonii,* new.

Coquillett in his well known Revision of the Tachinidae, page 74, listed the present genus as a synonym of *Epigrimyia* Townsend (genotype, *polita* Townsend; Trans. Am. Ent. Soc., 18: 395). The latter is a small moderately slender species with short broad wings, prominent epistoma and a long slender proboscis. In *robertsonii* the general build is decidedly more robust; the wings are of ordinary shape and the epistoma hardly extends beyond the vertical plane of the facial depression in profile. Perhaps the principal point of similiarity is the elongate proboscis in both species. Another important difference may be noted with respect to the female genitalia. In *polita* there is a chitinized sharp-tipped piercer-like organ, but no similar structure is present in *robertsonii.* There are additional differences but these items seem sufficient to validate *Siphoclytia.* In the original generic description Townsend characterized the frontal bristles in a single row descending to base of third antennal joint but in his recently published key to the tribe Leskiini he describes the frontal rows as stopping at the bases of the antennae (Manual of Myiology, Part IV, p. 66). The latter statement is in error. Although none of my 38 Texas specimens show the lowermost frontals on a level with the base of the third antennal segment, they are nevertheless distinctly beneath the base of the first segment.

Siphoclytia pavonacea, n. sp.

Similar to *robertsonii* in coloration, but less robust in build and the male genitalia show distinct differences.

Male.—Front not narrowed above, at vertex 0.33 of the head width; parafrontals gray with a tawny tinge, bearing only a few inconspicuous short black hairs; frontal vitta yellow, about equal to the width of one parafrontal; two pairs of well developed proclinate orbitals; frontals in a single row extending beneath antennal base; verticals two pairs, inner suberect but not very long, outer ones smaller and turned outward; ocellar bristles as large as outer verticals, proclinate; parafacial silvery white, bare, narrowed on lower extremity to less than half the width of third antennal segment; face hardly depressed or receding, slightly concave above front border of oral margin in profile, its ridges not prominent bearing a few minute hairs next to vibrissae, which are on the oral margin; antennae a trifle shorter than face, reddish, the third segment infuscated and about three times longer than second; arista brownish, micropubescent, thickened on less than proximal third, basal segments short; proboscis moderately slender, apical segment a little bowed, about equal to the head height; palpi yellow, rather short with the tips slightly thickened; cheek bare, about one-sixth the eye height; eyes bare, descending almost to level of vibrissae; back of head flat on upper part but rather noticeably projecting on lower edge behind the oral cavity, gray pollinose, beset with black hairs above and pale ones below.

Thorax black, gray pollinose marked with four blackish dorsal vittae, inner ones narrow in front, the outer wider but broadly interrupted at suture. Chaetotaxy: acrostichal 2,1; dorsocentral 3,3; humeral 3; posthumeral 1; presutural 1 (outer); notopleural 2; intraalar 3; supraalar 3 (middle one large); postalar 2; sternopleural 2,1; scutellum black, wholly pollinose with two large laterals, sometimes a smaller but distinct bristle between these, apicals lacking; infrascutellum strongly convex, pollinose; propleura and prosternum bare; calypters transparent, whitish with a perceptible tawny tinge.

Abdomen yellow with a broad black median vitta extending from base of first segment above to middle of third where it expands to include the entire apical half of latter; segments two to four thinly dusted with white pollen, no discals; third and fourth segment each with a marginal row and the second with one good-sized pair of median marginals; genital segments yellow, inner forceps united and rather short, tapering evenly to a pointed tip, hind surface with a sharp median keel; outer forceps finger-like, tips blunt; fifth sternite not prominent, deeply incised, yellow.

Legs yellow, with tibiae darker or brownish and the tarsi black; claws and pulvilli minute; mid tibia with one smallish bristle on outer front side near middle; hind tibia not ciliate.

Wings hyaline, the veins including costa yellow; first posterior cell open near extreme wing tip; bend of fourth vein broadly rounded, without stump or fold; first vein bare, third setulose almost to small cross vein; hind cross vein joining fourth slightly nearer bend than small cross vein; last section of fifth vein short; costal spine vestigial; epaulets brownish black.

Female.—Similar to male but the abdomen is considerably darker on the three basal tergites above, the fourth including genital segments reddish yellow; front at vertex 0.32 of the head width (average of two specimens).

Length; 5 to 5.5 mm.

Holotype.—Male, Amherst, Ohio, June 24, 1935 (A. J. Barckert). Paratypes: one female, same data as holotype, and one female, same locality, May 17, 1925 (H. J. Reinhard).

Hister puncticollis a Synonym of Hister osculatus (Coleoptera, Histeridae).—*Hister puncticollis* Schaeffer (Bull. Brook. Ent. Soc. Vol. VIII, p. 26, Dec. 1912) is a synonym of *Hister osculatus* Blatchley (Coleoptera of Indiana, p. 607, published in 1910). I have been able to examine Mr. Schaeffer's types through the courtesy of Mr. Charles A. Ballou, Jr., of New York City. No mention is made of *osculatus* in Schaeffer's description, and in 1928, when Mr. Schaeffer turned over his entire collection of Histeridae, including his type series, to Mr. Ballou, Mr. Schaeffer himself called attention to this synonymy.

H. osculatus is a very distinct species and is not likely to be confused with any other *Hister*. The descriptions of the two authors above cited are sufficient for identification. Blatchley's type locality is Posey County, Indiana, which is in the extreme southwestern corner of that state. In addition to Schaeffer's types from White Sulphur, W. Va., I have seen specimens from Deer Lodge, Tennessee, collected by Bernard Benesh, and from the following localities in South Carolina, collected by O. L. Cartwright: Clemson College; Jocasse; Tunne, Walhalla; and Waccamaw River, Longs P. O. The distribution of this species is apparently limited to the Austroriparian Faunal Area, where it is probably not rare. Benesh's specimens are labelled as having been taken from a species of ill-smelling mushroom.—Carl G. Siepmann, Rahway, N. J.

A NEW METAL MARK (CALEPHELIS) FROM TEXAS (LEPIDOPTERA, RHIODINIDAE).

By W. S. McAlpine, Birmingham, Mich.

Since the discovery of *Calephelis muticum* from Michigan, published in the April, 1937, issue of this Bulletin, the writer has been making a study of the genus *Calephelis,* as there seemed to be much confusion in identification in this genus among the leading museums in this country, as well as in the private collections. Whole-hearted cooperation by these museums and among private collectors has placed at the disposal of the writer considerable material for study.

My good friend, Dr. Geo. W. Rawson, a well-known Lepidopterist from Detroit, very kindly turned over such material as he had in his collection for study. Among his specimens was a small series which he had taken at Leon Springs, Bexar Co., Texas, in 1919. Leon Springs is located about eighteen miles northwest of San Antonio. After careful study and comparison with all known available types of this genus it appears that this series represents an undescribed species. The author proposes the name of *Calephelis rawsoni* for this species.

Calephelis rawsoni n. sp. (figs. 1 to 9 inc.).

Male: Expanse holotype 24.0 mm., average of 8 paratypes 24.5 mm., largest 25.0 mm., smallest 23.5 mm.

Upper Surface—Head: Top and eyes medium brown, front and palpi pale fulvous (tawny, reddish yellow approaching orange). Antenna black with white rings at joints. Dorsal surface of club black, ventral surface of club gray. Dorsal surface of thorax and abdomen fuscous (dark brown approaching black), sides of abdomen paler brown ventrally. Upper surface of wings dull reddish brown, inclined to chocolate brown in some specimens. In most of the male specimens there seems to be a slight smoky film over the upper surface of the wings, which is apparently caused by the lighter shade of brown at base of wing scales. This is not so pronounced as in *Calephelis wrighti* but is somewhat similar. There are darker brown scales along veins of both wings, and at base of wings and along costal and inner margins. On the basal half of both wings there is a series of dark brown linear markings which form four or five irregular transverse lines across the wings, which are more or less concentric with base. The most outward of these transverse lines is the heaviest and is composed of more scalloped-like markings, particularly in the secondaries where they are also faintly doubled in the upper half. Preceding the most outward of these transverse lines there is some darker scaling, which, together with the transverse line, gives the appearance of a rather narrow not very noticeable transverse dark band across both wings. This band varies considerably in specimens, in some being fairly well defined, in others including the holotype, scarcely noticeable. Beyond the outer transverse line are two very fine silver metallic lines between which is a row of fairly prominent black dots. The metallic lines are margined with fuscous. The outer metallic line is more prominent, continuous, close to and equidistant from edge of the wing, while the inner metallic line is irregular, considerably exserted near the middle of the wings, particularly so in fore wings, and hardly discernible in places. Beyond the outer transverse line the ground color of the wings is somewhat lighter.

The fringe is pale brown faintly checkered with white at apex, inner angle and middle of fore wing. In one of the paratypes there was apparently no white checkering of fringes. As noted in wing venation drawings, the outer edge of fore wing is undulated.

Under Surface: The legs and under surface of wings, thorax and abdomen are of a fairly uniform fulvous color, although the basal part of wings and legs, thorax and abdomen are lighter and not so reddish as outer part of wings. The basal markings which correspond to the transverse lines of the upper surface are disconnected and fine, the outer line being slightly heavier.

The silver markings of the upper surface are repeated, but are considerably heavier and have no fuscous margins. The outer metallic line is practically continuous, while the metallic spots of the inner line are disconnected and most are inclined to be somewhat crescent-shaped. There are three very fine metallic markings along the costa preceding the inner metallic line. The dots between the two metallic lines are repeated on the underside.

Female: Expanse allotype 24.5 mm., expanse of paratype 21.0 mm. The paratype looks like a stunted specimen.

Similar to male in general markings. Upper surface of a more uniform, lighter reddish brown color, with more definite and heavier markings. The transverse dark band through middle of wings, which is fairly well pronounced in some male specimens is not noticeable in the allotype or paratype. The smoky film which is noticeable over the upper surface of most of the male specimens is not very noticeable on the allotype or paratype. The primaries are more square cut and not so pointed as in the males.

The fringes are light brown with white checks at apex and inner angle of fore wings.

The under surface is similar in color to males with markings somewhat heavier.

Dr. Rawson took five specimens, three males and two females at Leon Springs, Texas. The dates of these specimens are Aug. 3rd and Aug. 7th, 1919.

According to Dr. Rawson they were all taken on vegetation along the sides of a stream at the bottom of a small gulch. The vegetation near the stream where specimens were taken, was grassy, with a mixture of ferns and other small plants which require moisture. The surrounding country is more or less flat and supports a sparse growth of scrub live oaks, junipers and a little mesquite with a ground cover of xerophytic grasses.

A search of museums has uncovered a half dozen more male specimens, two males from the Barnes collection in the U. S. National Museum, labelled Kerrville, Texas, with no other data. One male in the U. S. National Museum labelled Kerrville, Texas, H. Lacy collector. One male in the U. S. National Museum labelled Texas, B. Neumogen. This specimen was obtained from the Brooklyn Museum which formerly had the Neumogen collection. One male in The American Museum of Natural History labelled Kerrville, Texas, H. Lacy collector, July, 1908, acquisition No. 27,656. This specimen was in first-class condition and seemed quite typical, so was made the holotype. One male in The American Museum of Natural History labelled Kerrville, Texas, Nov., 1902, acquisition No. 27656. As noted all the definite locality labels, on the specimens uncovered at the U. S. National Museum and The American Museum of Natural History, indicate Kerrville, Texas, which is only about forty miles northwest of Leon Springs, so our present range for this species is confined to a very small area.

In general appearance it is easy to mistake small specimens of this butterfly for *Calephelis virginensis* or other closely related *Calephelis,* and it usually becomes necessary to make genitalic examination to be absolutely certain of identification, unless one is very familiar with the species. The male genitalia is readily separated from others in the genus in the United States, by the long, slender, pointed end of the upper annelus, which extends considerably beyond the end of the harpés and also by the heavy armature of the harpé as shown in the accompanying plate. A comparative study of male genitalia of some Mexican and Central American species available to the author does not disclose any exactly like it.

Genitalic slides were made of all the male paratypes, as there seemed to be some variation, particularly in weight of markings, the transverse dark band, and the shade of color and smoky film of the upper wing surface.

The species of this genus which seem to nearest resemble *rawsoni* are *virginensis* and *muticum* and to a lesser degree *borealis*.

Rawsoni is of about the same size as *muticum*, being slightly smaller than *borealis* and averages considerably larger than *virginensis*. All four species look very much alike in general color of the under side and the general markings are arranged quite similarly in *rawsoni*, *virginensis* and *muticum*. *Rawsoni* on both surfaces is not so heavily marked either with silver or other markings as *virginensis* or *muticum*. The color of the upper surface of male *rawsoni* is usually of a dull, slightly darker reddish brown than in *virginensis*, but the color of the females of these species is very similar. The upper surface of *muticum* is a rich mahogany color when fresh, while *borealis* is very dark with heavy fuscous scaling.

The outer transverse basal line of the secondaries of male *rawsoni* is scalloped. This does not occur in *muticum* and is usually not so well defined in *virginensis*.

On the under surface the markings of the inner silver line of male *rawsoni* are more crescent shaped (somewhat as in *borealis*) and of lighter weight than the same markings in *virginensis* and *muticum* which are heavy and square or roundish in shape.

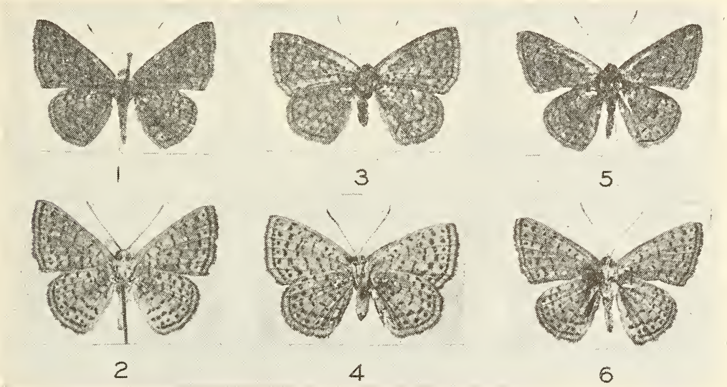
The fringe in *rawsoni* is usually quite noticeably checked with white, while in *virginensis* it is not checked, and in *muticum* is only rarely faintly checked.

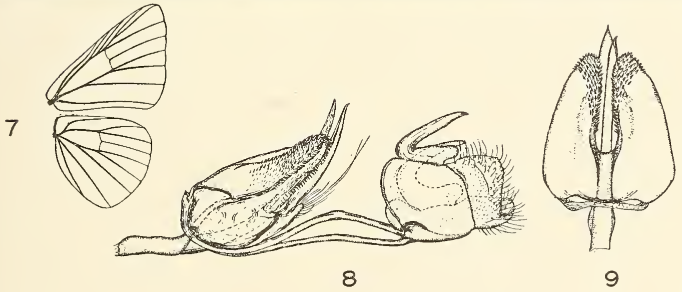
The wing shape of male *rawsoni* is slightly undulated while this is not so with the other three species.

The male genitalia of all four species are distinct as can be noted by a comparison with the illustrations in the original description of *muticum* and the accompanying plate.

The two females were found by Dr. Rawson in company with the male paratypes and are assumed to be the females of this species as they have a general resemblance to the males, except the usual difference in shape of wings which is noted in species of this genus. They differ from the females of the other three species in shape of primaries and more definite checkering of fringes as well as in other respects.

The author is greatly indebted to Dr. J. F. Gates Clark and the U. S. National Museum for aid in making up genitalic slides and identification and loan of specimens, also to The American Museum of Natural History for loan of specimens, and the Carnegie and Field Museums for loan of specimens of allied species. Several private collectors have also very kindly furnished specimens of allied species for study and comparison, including Geo. P. Engelhardt, Frank Chermock and Cyril dos Passos.





Explanation of Figures.

Figures 1 to 6 inclusive, natural size.

Photos by Allen Arnold, drawings by W. S. McAlpine.

Figures 1 and 2, *Calephelis rawsoni* n. sp., upper and lower surface respectively ♂ holotype, Kerrville, Texas, July, 1908, H. Lacy, collector, placed in the American Museum of Natural History.

Figures 3 and 4, *Calephelis rawsoni* n. sp., upper and lower surface respectively ♀ allotype, Leon Springs, Texas, Aug. 7, 1919, Dr. Geo. W. Rawson, collector, placed in the U. S. National Museum.

Figures 5 and 6, *Calephelis rawsoni* n. sp., upper and lower surface respectively ♂ paratype No. 1, Leon Springs, Texas, Aug. 3, 1919, Dr. Geo. W. Rawson, collecter, in the Collection of Dr. Rawson.

Figure 7, *Calephelis rawsoni* n. sp., wing venation of ♂ paratype No. 2, Kerrville, Texas, H. Lacy, collector, in U. S. National Museum.

Figure 8, *Calephelis rawsoni* n. sp., side view, genitalia of ♂ paratype.

Figure 9, *Calephelis rawsoni* n. sp., bottom view, genitalia of ♂ paratype with upper organs removed.

THE CHARLES SCHAEFFER COLLECTION.

Families of Coleoptera, as listed in Leng's Catalogue, donated by Cornell University from the Charles Schaeffer collection, by his children, Mrs. Cordt G. Rose and Mr. Charles L. Schaeffer:

- Haliplidae
- Gyrinidae
- Hydrophilidae
- Staphylinidae
- Melyridae
- Eurystethidae
- Othniidae
- Pedilidae
- Anthicidae
- Euglenidae
- Helmidae
- Heteroceridae
- Dascillidae
- Helodidae
- Dermestidae
- Byrrhidae
- Ostomidae
- Nitidulidae
- Rhizophagidae
- Cryptophagidae
- Mycetophagidae
- Lathridiidae
- Mycetaeidae
- Endomychidae
- Alleculidae
- Tenebrionidae
- Lagriidae
- Monommidae
- Platypodidae
- Scolytidae

The following holotypes are included:

- Ostomidae
  - *Ostoma oregonensis* Schaeffer
  - *Temnochila peninsularis* Schaeffer
  - *Temnochila edentata* Schaeffer
  - *Tenebroides arizonensis* Schaeffer
- Nitidulidae
  - *Nitidula nigra* Schaeffer
- Staphylinidae
  - *Belonuchus schaefferi* Cooper

Charles E. Palm.

NEW MEXICAN CALLIMOMIDAE (CHALCIDOIDEA).

By Osmond P. Breland,[1]
Department of Zoology and Physiology,
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In the fall and winter of 1931, Dr. Alfred C. Kinsey of Indiana University conducted the Indiana University Mexican Expedition into the western and central parts of Mexico. During the four months in these regions, he and the other members of the party collected many bushels of cynipid galls from various species of oak trees. These were returned to Indiana University, put in copper wire bags, and placed in window boxes. Some time later, the adults emerged in the bags under out-of-door conditions.

During the fall and winter of 1935, the Second Indiana University Mexican Expedition was organized. Again conducted by Dr. Kinsey, this group collected *Cynipidae* in the eastern and central parts of Mexico, and eventually went into Guatemala. The writer was fortunate in being a member of this second expedition.

Both these field trips were financed from three sources: the National Research Council, Indiana University, and by Dr. Kinsey personally.

As the collected *Cynipidae* emerged within the copper wire bags, many families of parasitic insects likewise came from the galls. It is upon some of the *Callimomidae* thus obtained, that this paper is based.

This family as well as some of the other families of the Chalcidoidea is rather difficult to work with taxonomically. The writer believes, however, that the accuracy of classification within the *Callimomidae* in many cases would be considerably increased if more types of data were employed. Morphological characteristics are undoubtedly important in taxonomic work, but it has been demonstrated in other groups that additional data can be effectively used. The greater the variety of characteristics that are taken into consideration, the less likely is one to be deceived by parallelisms and convergences.

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[1] Thanks are due to Dr. Alfred C. Kinsey of Indiana University who has supplied me with much of this material, determined the cynipid hosts of these parasites, and who made possible a field trip into Mexico and Guatemala. The nomenclature of the cynipid hosts is supplied by Dr. Kinsey, and it includes some manuscript names, which, in all cases are to be credited to Dr. Kinsey as the author.

The writer believes that at least two other lines of approach in addition to morphology, should be employed in dealing with the species of this family. Distribution and host relationships should be taken into consideration in all cases. While it is true that many species of *Callimomidae* may not be limited to one species of host, the possibility that some host restriction does exist, should be considered. Most careful work is necessary to determine whether host relationships will accord with such taxonomic interpretations of the host as Dr. Kinsey has made upon the *Cynipidae.*

It also seems probable that individual variation should be emphasized in specific descriptions, more than it has been in the past.

Since only a few species of *Callimomidae* are known from Mexico, it is only natural that in some cases the writer has not been able to determine the relatives of these new species. It is hoped, however, that as more material is collected and studied, it will be possible to fit the present species into their natural position in the family.

This is the first of a series of papers that the author hopes to write, dealing with Mexican and Guatemalan *Callimomidae.*

Callimome cognata n. sp.

FEMALE: Length 4.1 mm to 5 mm, average about 4.8 mm. Average length of ovipositor about 5.4 mm.

Scapes of *antennae* yellow to testaceous, rest of antennae black except pedicel, which sometimes has a greenish tinge. Ring joint very small, sometimes difficult to see. Segments longer than broad. Club only slightly longer than preceding antennal segment, joints of club difficult to define.

Face greenish bronze to nearly all bronzy. Eyes reddish. A conspicuous ridge between the bases of the scapes, extending to the margin of the mouth, although sometimes not as noticeable below middle of face. Face sparsely punctate ventrally, striate dorsally.

Dorsal portion of *thorax* bronzy with regions showing greenish in certain lights. The anterior portion is distinctly greenish in some specimens. Thoracic dorsum rugose, becoming rugoso-punctate posteriorly and on the scutellum. Posterior margin of scutellum with a distinct ridge, the ridge usually green. Mesepimeron usually possesses a purplish tint. No cross furrow on the scutellum, although in some lights an indication of a fused furrow may be seen in some specimens.

Metanotum somewhat carinate, with a series of depressions on the anterior margin.

A series of depressions on the anterior margin of the *propodeum.* On the anterior margin of the propodeum, in the mid-dorsal line, a carina is present which extends posteriorly, and divides into three or more branches.

First *abdominal* tergites deeply incised in the mid-dorsal line. Color of abdomen bronzy with a greenish tint in some regions. Sometimes with a wine-colored or purplish splotch dorsally.

Fore and middle *coxae* greenish, hind coxae green ventrally, bronze to brassy dorsally. Femora usually greenish medially on outer surface, tipped with, or gradually fading into testaceous or rufous distally. Usually with a small rufous area proximally. Rufous on the under surface. Ventral margin of femora somewhat denticulate. Tibiae testaceous to rufous. Tarsi densely pubescent, yellowish, tipped with black. Distal portion of segments and under surface sometimes darker.

Posterior tibial *spurs* less than one-half the length of the first tarsal segment. Middle tibial spurs somewhat longer than the posterior spurs.

Stigmal *vein* subsessile. Post marginal vein about twice the length of the stigmal.

MALE: Differs from the female in sexual characters and the following: Average length about 3.2 mm. Appearance of most specimens distinctly more greenish. Face occasionally wholly bluish green with a slight coppery tinge. Dorsal portion of thorax sometimes almost wholly green, with coppery iridescence. Posterior portion of thorax not as distinctly rugoso-punctate. Abdomen with more green in some specimens. Hind coxae not as distinctly bicolored in most cases. Femora usually almost wholly greenish. Tibiae sometimes partly or wholly greenish or piceous.

HOST: *Andricus* (*ruginosus*) *nimietas* (Kinsey MS.) (Kinsey det.).

TYPE LOCALITY: 15 miles west of Patos, Durango, Mexico.

TYPES: 30 Females and 11 males. Holotype and paratypes in the author's collection. Paratype females in the United States National Museum. Labeled: Patos, 15W., Dgo., 8500 feet, Mex., 11.11.31, Female, Male, spring '32. *Q. striatula,* Kinsey coll. ex. gall of *A.* (*rug.*) *nimietas,* Kinsey det.

This species according to published description, seems to be somewhat related to *Callimome mexicanum* Ashmead. The latter, collected from Guanajuato, Mexico, was reared from galls of *Andricus* (*rhizoxenus*) *championi* (Ashmead 1899). *Callimome cognata,* however, differs from *C. mexicanum* as follows: The ovipositor in *Callimome cognata* is comparatively shorter than in *C. mexicanum.* The legs are differently colored in the two species. There is a V-shaped carina in both species, but in *C. cognata* additional carinae connect to the V. The scutellar furrow is not well defined in *Callimome cognata.*

Dr. Kinsey states that the two cynipid hosts of these two species of parasites belong to complexes which are related. The callimomid species, therefore, possess physiological as well as morphological connections. The type localities of the two species are close enough together so that relationship would not be excluded on distributional grounds.

According to Huber (1927) there are specimens of *Callimome mexicanum* in the National Museum from Guanajuato, Mexico, the type locality, and also additional specimens determined by him from Williams, Arizona. This latter locality record while not impossible, might be questioned, since *Callimome cognata,* a related species lies between these two localities.

Callimome nubila n. sp.

FEMALE: Length 3 mm to 3.6 mm. average about 3.4. Average length of ovipositor 2.6.

Scapes of *antennae* yellow on outside surface, blackish on surface next to face, and on distal end. Pedicel, and sometimes ring joint green, rest of antennae black. Segments much longer than broad, the segments being hard to define distally.

Face bright green to greenish blue, sometimes purplish or iridescent. Facial carina hard to define.

Thorax bright green to brilliant blue green, sometimes with purplish regions, usually with brassy markings in various regions. Thoracic dorsum pubescent, hairs longer toward the posterior portions of the scutellum. No sign of a scutellar furrow. Usually a distinct brassy or golden region on the lateral portion of the metanotum, lateral portion of the scutellum, and posterior region of the axillae.

Abdomen green to greenish blue or purple, sometimes with brassy markings. On the dorsal surface, a rather large bronzy splotch medially. First tergites incised in the mid-dorsal line, the first tergite not completely overlapping the second.

Coxae green, tipped with light yellow. A rather noticeable depression present on the lateral region of the hind coxae. Rest of front and middle legs light yellow, tarsi usually tipped with brown. The hind legs except coxae, are yellow except that the femora are tipped with brown, while the tibiae are yellow proximally, fading into light brownish distally. The hind tarsi are tipped with brown. The hind tibial spurs are about one-half the length of the first tarsal segment.

Stigmal *vein* usually petiolate. Wings with a stigmal cloud, which varies considerably. Sometimes it is hardly visible, while in other specimens it is rather dense.

MALE: Differs from the female in sexual features, and the following: Average length about 2.5 mm. Scapes green, sometimes slightly brownish at the ends. Antennal segments subquadrate distally. Elongate hairs on scutellum sparse to absent in some specimens. Abdomen darker than in the female, sometimes nearly all bronzy. Cloud in wing usually not as noticeable as in female.

HOST: *Biorhiza* (*pulchripennis*) *stelis* Kinsey. (Kinsey det.).

TYPE LOCALITY: 7 miles north of Pachuca, Hidalgo, Mexico.

TYPES: 35 females, and 18 males. Holotype and paratypes in the author's collection. Paratype females in the United States National Museum. Labeled: Pachuca, Hgo., 7N, 8700 feet, Mex., 1.15.32, female male spring 32. *Q. rhodophlebia,* Kinsey coll. ex. gall of *Bior.* (*pul.*) *stelis,* Kinsey det.

It has so far not been possible to positively determine any near relative of this species. The published description of *Callimome rudbeckiae* Ashmead somewhat resembles this species, but before anything can be definitely determined, the types must be compared. *Callimome rudbeckiae* was reared from a gall on *Rudbeckia,* species. There does not therefore appear to be any host connection between the two species.

Callimome denticulata n. sp.

FEMALE: Length 2 mm to 2.5 mm, average length about 2.2 mm. Average length of ovipositor about 1.5.

Scapes of *antennae* green with a brassy tinge, tipped with brown proximally. Pedicel and ring joint green, rest of antennae black. Segments longer than broad. In some specimens, there is the appearance of a ring around the central portion of the segments.

Face green, usually with a brassy or coppery tinge in various regions. Lower portion of face feebly punctate, the punctations being large but very shallow. Dorsal portion of head very thin anterio-posteriorly. A distinct purple region next to the outer eye margin.

Thorax strongly arched. The dorsal surface green or greenish blue, usually with a brassy or coppery tint. Sometimes with rather large, wholly copper colored areas. Surface with sparse, rather large, but shallow, depressions which are usually deeper, and which may form definite punctations on the anterior part of the scutellum. Scutellar furrow definite in most specimens. Surface posterior to the furrow free of punctations.

Propodeum relatively smooth except for a large depression on each side of the mid-dorsal line.

Abdomen green to bluish green dorsally, sometimes with a brassy tinge. A coppery splotch is present on the dorsal surface medially. Ventrally, green to coppery in some specimens. First tergites incised in the mid-dorsal line.

Coxae and femora greenish, in many cases with a brassy or coppery tinge, although sometimes almost wholly brown. Legs usually brown at the joints. Hind coxae usually distinctly bronzy or brassy dorsally. Tibiae mostly green, but sometimes tipped with brown, or nearly all bronzy. Tarsi yellowish tipped with black. Longest hind tibial spur about one-half the length of the first tarsal segment.

Hind femora denticulate with usually a small but distinct *tooth* present distally. Sometimes only a dentiform angle is present.

No stigmal cloud in *wings* except as noted later. Stigmal vein subsessile to petiolate, the post-marginal vein usually not quite twice the length of the stigmal.

MALE: Differs from the female in sexual characteristics, and the following: Average length about 1.7 mm. Thorax usually not so strongly arched, and the thoracic depressions not as noticeable as in the female. The color of the thorax and abdomen is darker in a few specimens.

HOST: *Feron* (*crystallinum*) *tostum* Kinsey (Kinsey det.)

TYPE LOCALITY: 30 miles west of Namiquipa, Chihuahua, Mexico.

TYPES: 70 females and 45 males. Holotype and paratypes in the author's collection. Paratype females in the United States National Museum. Labeled: Namiquipa, Chi., 30 W., 5200 feet, Mex., 10.18.31, female male 7.1.32. *Q. chihuahuensis,* Kinsey coll. ex. gall of *Feron* (*crys.*) *tostum,* Kinsey det.

There are many specimens in this series in which the antennae or other parts of the body are somewhat broken. Since, however, such a large series was studied, a composite description was easily made.

This species was placed in the genus *Callimome* despite the presence of a definite tooth on the hind femora in most specimens. As has been mentioned previously (Breland MS) it seems that decidedly too much emphasis has been placed on the presence or absence of a tooth on the hind femora, to separate this genus from *Diomorus*. Despite the presence of this tooth, this species is a true *Callimome*. The tooth character, therefore, unsupported by other characteristics, fails in some cases to separate the genera *Callimome* and *Diomorus*.

It has so far been impossible to determine with certainty any near relative of this species. Two other species of *Callimome* have been described that possess a tooth on the hind femur: *Callimome fullawayi* Huber, and *Callimome texanum* Hoffmeyer. These species, according to published descriptions, resemble *Callimome denticulata* in a few points, but since there is such a difference in others, I do not believe these insects are related. In a final analysis, however, it will be necessary to compare the actual types.

In studying over the specimens in this series, a rather interesting thing was discovered. As indicated in the above description, the wings of this insect do not possess a stigmal cloud. Several female specimens were discovered, however, that did possess a stigmal cloud in their wings. In addition, the body color was usually somewhat darker than in the other specimens. The other characteristics of these specimens came within the range of the individual variation of the species. Because of the small number of insects exhibiting these characteristics, the author was not able to interpret this phenomenon entirely to his satisfaction. He believes, however, that these specimens possibly represent mutant individuals, which have as yet not had the time or chance to extend these characteristics to the other members of the species. At any rate, because of the bare possibility that these specimens might represent another but closely related species, these insects were not included in the type series.

Callimome crassa n. sp.

FEMALE: Length 2.8 mm to 4 mm. Average length about 3.5 mm. Average length of ovipositor about 3.7 mm.

Scapes of *antennae* usually light rufous, darker at the distal tip. Pedicel bronze to greenish, rest of antennae black. Segments longer than broad. (Club broken off in all specimens.)

Lower part of *face* coppery to purple, sometimes greenish just above base of mandibles. Usually replaced by green sometimes with a brassy tinge dorsally.

Dorsal portion of *thorax* green to brassy or bronzy, the green specimens with a brassy to coppery tint. Only a faint indication of a fused cross furrow on the scutellum. Surface finely punctate, with indications of larger shallower punctations. Other sutures easily distinguishable. Part of the meso-sternum, lower portion of mesepisternum, and sometimes prepectus, blue to purple. Usually not as much purple present as in the next species.

On the anterior margin of the *propodeum,* on each side of the mid-dorsal line, a row of depressions is present. The lateral depressions are sometimes larger than those closer to the mid-dorsal line.

Anterior *abdominal* tergites incised in the mid-dorsal line. The posterior tergites are comparatively thick, so that the segmentation is easily distinguished. Dorsal anterior portion of abdomen green, with a purplish bronze splotch near the center. Sometimes coppery posteriorly. Green dorso-laterally, fading into copper color ventrally. Rarely most of the abdomen with a golden tinge.

Hairs on abdominal surface sparse and not conspicuous.

Front *coxae* greenish, middle coxae greenish or bronzy, hind coxae green ventrally, bronzy purple dorsally. Femora green, sometimes with a coppery tinge on the outer margin, sometimes bronzy. Coppery on the inner margin. Fore and middle femora tipped with yellow to light rufous, the posterior femora tipped with light rufous. Tibiae light rufous to piceous, sometimes with a greenish tinge; the posterior tibae usually slightly darker than the middle and fore. Tarsi yellowish tipped with black. Sometimes slightly darker at the joints. Hairs on under surface sometimes darker.

Stigmal *vein* short, sessile. Post marginal usually at least twice the length of the stigmal. No indication of a stigmal cloud.

MALE: Differs from the female in sexual features, and the following: Average length about 2.5 mm. Distal antennal segments more sub-quadrate than in female. The antennal club is present in some male specimens, and is about one and one half times the length of the preceeding antennal segment. Scapes of antennae nearly all green or greenish blue in most cases. Facial carina sometimes more prominent. Tibiae darker in most specimens. Head, thorax, and abdomen sometimes darker bronze in color.

HOST: *Cynips* (*dugèsi*) *emergens* Kinsey (Kinsey det.).

TYPE LOCALITY: 20 miles east of Pacheco, Chihuahua, Mexico.

TYPES: 12 females and 4 males. Holotype and paratypes in the author's collection. Labeled: Pacheco, 20 E.Chi., 10.11.31, Mex., 5400 feet, female male 7.10.32. *Q. sacame,* Kinsey coll. ex. gall of *C.* (*dugèsi*) *emergens.*

It has so far not been possible to determine with certainty any relative of these insects among described species of *Callimomidae.* As indicated later, however, this species is closely related to the following.

Callimome nuda n. sp.

FEMALE: Length 3 mm to 4 mm. Average length about 3.5 mm. Average length of ovipositor 3.9.

Scapes of *antennae* light rufous, dorsal portion tipped with black. Pedicel green, rest of antenna black. Segments longer than wide. (Club broken from all specimens.) Ring joint very short.

Dorsal portion of *face* bluish to green. Mid-portion somewhat bronzy, usually greenish just above bases of mandibles. Facial carina fairly prominent between bases of scapes, and in some cases to be traced to the bases of the mandibles. It is, however, less noticeable on the lower part of the face.

Dorsal portion of *thorax* green with a coppery to brassy tint. Surface with small punctations, with indications of larger shallower depressions. An indication of a fused scutellar furrow in most specimens. Lower part of mesepisternum, portion of mesosternum, prepectus, and sometimes other parts of the mesopleuron, blue to brilliant purple. Usually more purple present than in the preceeding species.

On each side of the mid-dorsal line, on the anterior margin of the *propodeum,* a series of rather large depressions, which extend a little over one-half the distance to the spiracle.

First *abdominal* tergites incised in the mid-dorsal line. Color of abdomen dark green to bluish green basally. A definite bronzy splotch present in the mid-region dorsally. Rest of abdominal surface dark green, with an undertone of brown in various regions in some specimens. Green laterally, grading into bronze toward the ventral surface. Only a few sparse hairs present. Tergites comparatively thick, so that the segmentation is easily distinguished.

Coxae greenish, the dorsal portion of the posterior ones being bronzy. Femora green, usually with a bronzy tinge, and in some cases tipped with rufous distally. No teeth present on the hind femora. Fore and middle tibiae variable. Sometimes wholly rufous or wholly greenish piceous. At other times greenish piceous tipped with rufous. Posterior tibiae greenish piceous medially, sometimes lighter at each end. Tarsi yellow tipped with black.

Stigmal *vein* sessile. Post marginal two to three times as long as the stigmal. No evidence of a stigmal cloud.

MALE: Differs from the female in sexual characteristics, and the following: Average length 2.5 mm. Antennal scapes dark green to piceous, sometimes lighter proximally. Tibiae never wholly rufous. Postmarginal vein slightly shorter than in female. Thorax sometimes with more blue or bluish green than in female.

HOST: *Cynips* (*dugèsi*) *oriens* Kinsey. (Kinsey det.).

TYPE LOCALITY: 7 miles southeast of Miquihuana, Tamaulipas, Mexico.

TYPES: 8 female and 4 male specimens. Holotype and paratypes in the author's collection. Labeled: Miquihuana, Tams., 7 SE, 6000 feet, Mex., 11.15.35, female male 11.19.35. *Q. sacame,* Kinsey coll. ex. gall. of *C.* (*dugèsi*) *oriens,* Kinsey det.

Although it has not been possible to determine any previously described relative of *Callimome nuda,* it is definitely related to the preceding species, *Callimome crassa.* A glance at the specific description, will indicate the morphological similarity. In addition, these two species parasitize two closely related species of host insects. The type localities are not too far apart to preclude relationship on distributional grounds. These two species, however, differ in a number of points, the following of which seem to be the most evident:

The facial carina is in many cases more prominent in *Callimome nuda.* The dorsal region of the head and face in *Callimome nuda* is usually distinctly bluish in certain regions, while in *Callimome crassa* it is green with a distinct brassy tinge, never bluish. *Callimome nuda* possesses in most cases considerably more purple on the lateral portion of the thorax. The basal dorsal portion of the abdomen in *Callimome crassa* is green, while in *Callimome nuda* it is greenish blue to purple. The hind tibiae are usually somewhat darker in color in *Callimome nuda.* Most of the males of *Callimome nuda* possess considerably more blue or bluish green color on various parts of their body than the males of *Callimome crassa.*

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In the matter of spelling and in the explanation of terms, also, this Glossary represents the consensus of the best opinion—*not* the personal views of the compiler.

We continue to decline to restrain any author from saying what he has to say, in his own way.—THE EDITOR.

NEW OR INSUFFICIENTLY-KNOWN CRANE-FLIES FROM THE NEARCTIC REGION (TIPULIDAE, DIPTERA). PART V.

By Charles P. Alexander, Amherst, Mass.*

The preceding part under this title was published in 1938 (Bull. Brooklyn Ent. Soc. 33: 71–78). Except where indicated to the contrary, the types of the new species herein defined are preserved in my personal collection. I am greatly indebted to Messrs. Brower, Hanson, Ide, Macnab, Procter and Ting for the privilege of studying this material.

Tipula (Lunatipula) macnabi n. sp.

General coloration yellow, the praescutum with four more orange-brown stripes; antennae long; pleura yellow with a sparse whitish bloom; femora black, with an obscure yellow subterminal ring, the tibiae and tarsi black; wings grayish brown, the costal border, with the stigma, darker brown; a conspicuous white obliterative area before and across cord; abdomen yellow, the tergite with three narrow brown stripes; male hypopygium with the tergite produced into two strongly divergent, submedian, black spines; inner dististyle with the beak very slender, the dorsal crest conspicuously serrate; eighth sternite elongate, projecting, the apex with a fringe of unusually long setae.

Male.—Length about 17–18 mm.; wing 16–17.5 mm.; antenna 6 mm.

Frontal prolongation of head obscure brownish yellow, sparsely pruinose above; nasus distinct; palpi dark. Antennae relatively long, as shown by the measurements; scape and pedicel light yellow, first flagellar segment brownish yellow, remainder of flagellum black; flagellar segments strongly incised; longest verticils subequal to the segments. Head gray, lighter on anterior portion and on the narrow orbits; a more or less distinct darker median vitta.

Praescutum grayish yellow, with four more orange brown stripes that are scarcely apparent against the ground; posterior sclerites of notum buffy-yellow; scutal lobes variegated by slightly darker areas. Pleura yellow, with a sparse whitish bloom. Halteres with stem yellow, knob weakly darkened. Legs with coxae yellow, sparsely pruinose; trochanters yellow; femora narrowly yellow basally, the remainder black, with an obscure yellow subterminal ring; tibiae and tarsi black. Wings with the ground-color grayish brown; cells *C* and *Sc*, with the stigma darker brown; a small brown spot at origin of *Rs*; a conspicuous whitish obliterative area before stigma and cord, crossing cell *1st* M_2 into base of cell M_3; a less distinct post-stigmal brightening; veins dark. Venation: *Rs* about two and one-half times the length of *m–cu*; R_2 long, nearly one-half the short R_1; *m–cu* a short distance before fork of M_{3+4}.

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* Contribution from the Entomological Laboratory, Massachusetts State College.

Abdomen yellow, the tergites with a narrow brown median vitta that is slightly interrupted at the sutures; less distinct sublateral brown lines, beginning on the posterior portion of second tergite; hypopygium brown. Male hypopygium with the caudal margin of tergite produced into two black submedian spines that are strongly divergent, separated by a V-shaped notch; ventral surface of tergite on either side of midline with a small blackened point. Basistyle unproduced, but with a detached outer sclerite that is extended into a long sinuous spine. Outer dististyle at apex much enlarged into a head. Inner dististyle a compressed blade, the beak very long and slender, the high dorsal crest conspicuously serrate; base of style produced into two small sclerotized lobes, the narrower one glabrous. Eighth sternite elongate, narrowed outwardly, projecting, the slightly concave apex on either side bearing a fringe of unusually long setae, the submedian ones shorter; on ventral surface of sternite a deeply forked median sclerotized plate.

Habitat: Oregon.

Holotype: ♂, Boyer, September 25, 1937 (*Macnab*). *Paratopotypes,* 1 ♂, April 15, 1937; 1 ♂, July 30, 1936.

Tipula (*Lunatipula*) *macnabi* is named in honor of the collector, Professor James A. Macnab. The fly is very different from other similar yellow species, especially in the coloration of the legs and wings, and in the structure of the male hypopygium. It most resembles species such as *T. splendens* Doane and *T. lamellata* Doane, but is entirely distinct.

Tipula (Lunatipula) tingi n. sp.

Mesonotal praescutum ochreous, with four grayish stripes that are margined with dark brown; nasus lacking; antennae with basal three segments yellow, the remainder dark; femora brownish yellow, restrictedly more darkened at tips; wings with a strong brown tinge, the stigma darker; a broad, very conspicuous, white band before cord, extending from costa into base of cell M_3; abdominal tergites yellow, the outer segments more uniformly darkened, conspicuously trivittate with darker brown, the median vitta especially broad and conspicuous; ninth tergite with a very broad and deep V-shaped notch; eighth sternite with conspicuous lateral lobes that are tufted with setae, the median area with a brush of long setae.

Male.—Length about 16–17 mm.; wing 16–17 mm.; antenna about 5 mm.

Female.—Length about 24 mm.; wing 19 mm.

Frontal prolongation of head obscure yellow; nasus lacking; palpi with basal segments obscure yellow, the two outer segments passing into black. Antennae with basal three segments yellow; remaining segments weakly bicolored, the basal enlargements black, the apex of stem paling to reddish brown; outer segments more uniformly blackened; flagellar segments moderately incised; verticils conspicuous, subequal in length to the segments; terminal segment very reduced. Head with front obscure yellow, posterior sclerites brown, more grayish on posterior orbits; vertex with a linear dusky median vitta.

Mesonotal praescutum ochreous, with four gray stripes that are narrowly bordered by darker brown, somewhat more conspicuous along the mesal edges of the intermediate stripes, the anterior ends of the latter clearer gray; scutum with lobes gray, the median area yellow; scutellum yellow, sparsely pruinose, with a capillary brown median vitta, the parascutella more dusky; mediotergite yellowish gray medially, more ashy gray on posterior third, the basal lateral portions broadly infuscated. Pleura yellowish gray, the mesepisternum somewhat clearer gray. Halteres yellow, the knobs dark brown. Legs with the coxae and trochanters yellow; femora brownish yellow, restrictedly more darkened at tips; tibiae and basitarsi obscure yellow, the tips narrowly darkened; outer tarsal segments uniformly black. Wings with a strong brown tinge, the prearcular field and costal border clearer yellow; stigma and a spot at tip of Sc_2 darker brown; very restricted and less evident dark seams at origin of Rs and on posterior cord; a very conspicuous white obliterative band before cord, extending from vein C to the basal fourth of cell M_3; no distinct post-stigmal brightening; veins brown. Squama with five strong setae. Venation: R_{1+2} present; Rs about two and one-half times as long as $m-cu$; M_{3+4} nearly as long as the basal section of M_3.

Abdominal tergites with the ground color yellow, clearer on the more basal segments, passing into brown on the fifth and succeeding tergites; three brown stripes, the median one broad and conspicuous; lateral stripes beginning on posterior half of second tergite, widened behind, the extreme lateral borders gray; sternites brownish yellow; hypopygium pale brown. In the female, the median tergal stripe is conspicuous and virtually continuous but the lateral pair is broken into spots on segments two to five, inclusive. Male hypopygium with the tergite transverse, with an unusually large V-shaped notch, the lateral lobes subacute at tips. Outer dististyle spatulate on distal two-thirds or more. Inner dististyle with apical beak darkened, obtusely rounded; a conspicuous lobe on outer margin at base; outer edge of style with unusually abundant, long, coarse setae. Each gonapophysis terminating in an acute point, before apex with a conspicuous lateral arm. Eighth sternite with conspicuous lateral lobes that are tufted with long yellow setae; median region notched, with a brush of long conspicuous setae.

Habitat: California.

Holotype: ♂, Marin County, bred from larvae in decaying wood and leaves, collected March 10, 1935, emerged April 11, 1935 (*Ting*). *Allotopotype,* ♀, *Paratopotype,* ♂, larva collected March 10, 1935, emerged April 8, 1935. Types in collection of the U. S. N. M.

Tipula (*Lunatipula*) *tingi* is named in honor of the collector, Mr. P. C. Ting. The species is allied to several others in the western United States, apparently being closest to *T.* (*L.*) *lygropis* Alexander, of Santa Cruz Island. The structure of the male hypopygium is distinctive.

Limonia (Limonia) pemetica n. sp.

Allied to *simulans;* general coloration gray, the praescutum with three conspicuous, dark brown stripes; femora obscure yellow, the tips blackened, preceded by a clearer yellow ring; wings subhyaline, spotted and dotted with brown, including a series of about seven spots along vein *Cu*; a single dark area involving the tip of *Sc* and origin of *Rs*; *Sc* schort, Sc_1 ending about opposite one-fifth the length of *Rs*; *m–cu* a short distance before fork of *M*; male hypopygium with the rostral spines blackened, conspicuous, widely separated; just caudad of the rostral prolongation on face of ventral style a small blackened lobe covered with appressed spines; mesalapical lobe of gonapophysis long and slender.

Male.—Length about 7 mm.; wing 8 mm.

Rostrum light brown; palpi darker. Antennae brown, the flagellar incisures a little paler. Head gray.

Pronotum brown, pruinose. Mesonotal praescutum gray pruinose, with three conspicuous dark brown stripes, the median one becoming obsolete before suture; scutal lobes darkened, the median area gray; posterior sclerites of notum brownish testaceous. Pleura pale, the surface gray pruinose. Halteres pale, the knobs dark brown. Legs with the coxae and trochanters pale; femora obscure yellow, the tips blackened, preceded by a clearer yellow ring; tibiae obscure yellow, the tips narrowly and weakly darkened; tarsi pale brown, the outer segments darker. Wings relatively narrow, subhyaline, spotted and dotted with brown, including a series of four costal areas, the third involving both the fork of *Sc* and the origin of *Rs*; stigmal area confluent with a cloud at fork of *Rs*; a series of about seven spots along vein *Cu*; cord and outer end of cell *1st* M_2 narrowly seamed with brown; abundant brown dots in cells of wing; veins pale brown, darker in the clouded areas. Venation: *Sc* relatively short, Sc_1 ending about opposite one-fifth the length of *Rs*, Sc_2 beyond this origin; a supernumerary crossvein in cell *Sc* at near two-thirds the length; *m–cu* a short distance before fork of *M*; cell *1st* M_2 about as long as vein M_{1+2} beyond it, its inner end arcuated.

Abdominal tergites dark brown, the basal sternites more yellowish; hypopygium pale. Male hypopygium with the caudal margin of tergite emarginate, the lateral lobes broadly obtuse. Basistyle with ventromesal lobe rounded. Ventral dististyle larger than the basistyle, the rostral prolongation relatively slender, with two black spines that are widely separated, the outer shortly before tip of prolongation, the inner oblique, subbasal in position; on face of style, caudad of base of prolongation, with a small curved darkened lobe covered with microscopic appressed spines; vestiture of mesal face of style consisting of abundant delicate setae. Dorsal dististyle a gently curved pale rod, the tip subobtuse. Gonapophyses with mesal-apical lobe long and slender, gently curved.

Habitat: Maine.

Holotype: ♂, Hunter's Beach, Mount Desert, September 24, 1935 (*Brower*).

Limonia (*Limonia*) *pemetica* is generally similar to *L.* (*L.*) *simulans* (Walker), yet very different in the structure of the male hypopygium. It may well have been confused in collections with *simulans*. It is similarly related to the Rocky Mountain *L.* (*L.*) *nelliana* (Alexander), which has *Sc* even shorter, Sc_1 ending opposite the origin of *Rs*. The specific name, *pemetica,* is derived from the Indian name of Mount Desert Island.

Pedicia (Pedicia) procteriana n. sp.

General coloration gray, the praescutum with four brown stripes, the intermediate pair darker than the laterals; halteres pale throughout; femora brown, the tips somewhat darker; wings yellowish subhyaline, with the usual dark pattern of the subgenus; dark seam along vein *Cu* variable, in the type reaching wing-margin, in the paratype ending at level of cord; two isolated brown spots beyond cord at outer end of cell *1st* M_2; cord very oblique; cell M_1 short, subequal to its petiole; cell *1st* M_2 relatively long, its length about twice the maximum breadth; cell M_4 deep, its length nearly three times the width at base; abdominal tergites gray, with a conspicuous, darker gray area that is narrowly margined with brown, these areas only moderately narrowed behind; male hypopygium with ventromesal lobe of basistyle relatively short; ninth tergite without modified groups of setae on basal-lateral portions of dorsal face; lobe of mesal face of basistyle fringed with long setae.

Male.—Length about 24 mm.; wing 22 mm.

Rostrum dark, pruinose; palpi black. Antennae with the scape and pedicel black; flagellum broken. Head light gray; vertical tubercle small but distinct.

Mesonotal praescutum gray, with four brown stripes, the intermediate pair separated by a capillary ground vitta, darker than the laterals; scutum gray, each lobe with two dark areas; median region of the transverse suture darker brown; scutellum more reddish gray; mediotergite gray, the posterior half more reddish. Pleura pale, sparsely pruinose; dorsopleural region dark brown. Halteres pale throughout. Legs with the coxae light gray; trochanters brown; femora brown, the tips somewhat darker; tibiae brown, the bases narrowly, the tips more broadly, blackened; tarsi black. Wings yellowish subhyaline, with the usual pattern of the subgenus; costal border pale, especially the basal half of costal cell; dark seam along vein *Cu* reaching margin as a narrow seam along distal section of Cu_1; two isolated dark spots beyond the seam at cord, one at *m*, the other at fork of M_{3+4}; veins brownish yellow, darker in the clouded areas. Trichia of veins of moderate length. In the paratype, the dark seam along *Cu* ends opposite *m–cu* or nearly so. Venation: Cord very oblique; cell M_1 short, subequal to its petiole; cell *1st* M_2 relatively long, its length about twice the maximum breadth; cell M_4 deep, its length nearly three times the width at base.

Abdominal tergites light gray, each segment with a conspicuous, darker gray, brown margined area, narrowed behind, the width at apex about one-half the greatest diameter of the area; incisures narrowly pale; sternites gray laterally, with a nearly continuous median brown stripe; hypopygium dark. Male hypopygium having ninth tergite without modified brushes of setae on basal-lateral portions of dorsal surface, as in *contermina*; median area of tergite produced into a depressed lobe, the caudal margin gently emarginate, subtended on either side by a flattened plate, the apex truncate. Basistyle with ventro-mesal lobe of moderate length, when viewed from beneath not extending caudad beyond the level of the dististyles, broad-based, stout, the apex with abundant spinous setae; viewed from above, the apex of this lobe is visible opposite the inner arm of dististyle; outer apical region of basistyle with a brush of long, dark-colored setae. Interbasal rod relatively small, with a broader flattened lobe immediately caudad, the apex of latter fringed with long pale setae. Dististyle trifid, the outer blade more expanded, more or less cultriform; central lobe more slender, pointed at apex and without blackened spines, as in *contermina*; innermost lobe very low and obtuse, densely set with short blackened spines.

Habitat: Ontario, Maine.

Holotype: ♂, Corfield, Mount Desert, Maine, July, 1937 (*Procter*).

Paratype, a broken specimen, probably a female, Horning's Mills, Ontario, June 12, 1928 (*F. P. Ide*). It is presumed that the adult of the holotype flew from one of the rocky mountain streams above Corfield, as perhaps Duck Brook.

I take unusual pleasure in naming this striking crane-fly in honor of my friend, Dr. William Procter, whose recently published list of the insects of Mount Desert must long remain our chief source of information concerning this fascinating region. The species is most similar to *Pedicia* (*Pedicia*) *contermina* Walker, yet is amply distinct. The reduced ventro-mesal lobe of the basistyle of the male hypopygium is more as in P. (P.) *albivitta* Walker, which in other regards is entirely different. In *contermina,* besides the characters above mentioned, the median lobe of the tergite is shorter and broader, with the margin more deeply emarginate, the subtending plates reduced. Ventro-mesal lobe of basistyle very large and greatly produced, extending caudad beyond the level of the dististyle in both dorsal and ventral views, the mesal edge with a brush of blackened setae, additional to more normal yellow ones. Body of basistyle short and stout, with a rounded lobe on dorsal-mesal aspect; mesal lobe caudad of interbase more flattened, not conspicuously tufted with setae.

Rhabdomastix (Sacandaga) hansoni n. sp.

General coloration of thorax almost uniformly dark brown, sparsely pruinose; halteres pale yellow; legs brownish yellow; wings subhyaline, sparsely patterned with brown, including the stigma and seams on anterior cord and along vein Cu; prearcular field more whitened; numerous macrotrichia on veins beyond cord; Sc relatively short, Sc_1 ending shortly beyond midlength of Rs; R_3 slightly oblique; abdomen black.

Female.—Length about 8 mm.; wing 6.5 mm.

Rostrum dark brown, pruinose; palpi black. Antennae with the scape and pedicel brown, flagellum obscure yellow; flagellar segments with long verticils, the longest ones secund. Head brownish gray.

Mesonotum almost uniformly dark brown, the surface sparsely dusted with gray, thinner on median region of praescutum, leaving the surface subnitidous; anterior lateral pretergites pale yellow; pseudosutural foveae dark; median area of scutum a little paler. Pleura dark brownish gray. Halteres pale yellow. Legs with the coxae pale, sparsely pruinose; trochanters yellow; remainder of legs pale brownish yellow. Wings subhyaline, sparsely patterned with brown, including the stigma and seams on anterior cord and along vein Cu; prearcular field more whitish; veins brown. Macrotrichia abundant on veins beyond cord. Venation: Sc relatively short, Sc_1 ending just beyond midlength of Rs, Sc_2 close to its tip, about opposite midlength; R_3 slightly oblique, about equal to the distance on costa between tips of veins R_{1+2} and R_3; R_4 longer than R_{2+3+4}; cell *1st* M_2 small.

Abdomen black, including the genital shield and valves of ovipositor.

Habitat: Massachusetts.

Holotype: ♀, Paradise Trail, Mount Toby, Franklin Co., altitude 600 feet, July 19, 1938 (*Hanson*).

Rhabdomastix (*Sacandaga*) *hansoni* is named in honor of the collector, Mr. John Francis Hanson, student of the Plecoptera. The species is very different from all those previously described from northeastern North America, especially in the body coloration and sparsely patterned wings. It is closest to *R.* (*S.*) *subfasciger* Alexander, of Alberta, differing in details of coloration and venation, as the shorter *Sc* and more oblique R_3.

Ormosia broweri n. sp.

Related to *arcuata,* differing especially in the structure of the male hypopygium.

> *Male.*—Length about 5.2–5.5 mm.; wing 6–6.5 mm.
>
> General coloration of body gray pruinose. Antennae black throughout. Legs dark brown. Wings with a strong brown suffusion, cell *C* and the stigma darker brown. Venation: Veins R_3 and R_4 slightly upturned at tips; vein *2nd A* strongly sinuous.
>
> Male hypopygium with the lateral apophyses of the phallosome entirely different from *arcuata,* appearing as relatively straight, broad-based rods, the distal fourth narrowed and deflected laterad into acute points. In *arcuata,* these horns subtend the central plates of the phallosome, each appearing as a slender spine, strongly arcuated at midlength, the long straight apical point directed caudad and slightly mesad. The paratypes differ very slightly in having the lateral apophyses appearing as straight, long-triangular points that are gradually narrowed to the acute tips.

Habitat: Maine.

Holotype: ♂, Mount Desert, near Entomological Laboratory, May 15, 1935 (*Brower*). *Paratypes,* 3 ♂♂, April 28, 1936; May 16, 1937.

I take great pleasure in naming this interesting *Ormosia* in honor of Dr. A. E. Brower, whose intensive efforts have added vastly to our knowledge of the insect fauna of Mount Desert.

THE SENSES OF SPIDERS.

By Cyril E. Abbott, Searcy, Ark.

Introductory.

Since there is no such thing as a "typical" arthropod, it is impossible to make generalizations concerning the characteristics of these animals from any one Class. It is possible, however, to compare one Class with another, for the fact that certain groups are more closely related to one another than to other arthropods is indisputable.

So far as the structure and operation of sense organs is concerned, spiders closely resemble insects. Yet there are also some dissimilarities between the two groups. Throughout this paper the attempt will be made to compare the sensory reactions of arachnids with those of insects. In this way one may obtain more precise knowledge of the manner in which the senses of arthropods function.

I.

The Nervous System of Arachnids.

The nervous system of arachnids is highly concentrated, even in the more generalized forms, and in spiders this concentration about reaches its possible limits. The most primitive condition is probably found in scorpions (10), which exhibit distinct segmentation of the thoracic ganglion, and have some of the abdominal ganglia distinct. The distribution of nerve trunks is also less specialized in scorpions than in spiders; for, whereas in spiders those to the labrum and lateral eyes are distinct throughout their lengths, those of scorpions have a common root (9).

In true spiders it is difficult to detect segmental divisions in the nervous system, even in microscopic sections. The cerebral mass or "brain" can be distinguished from the cephalothoracic nerve mass simply because the oesophagus, which passes between them, leaves only a pair of commissures connecting them. The thoracic mass is highly concentrated, and the nervous masses of the abdomen have disappeared or fused with those of the cephalothorax; the nervous supply of the abdomen consisting of a pair of nerve trunks which ramify throughout the abdominal tissues. Each appendage is, of course, supplied through a similar fiber from that part of the ganglionic mass nearest it. The eyes are also each supplied with a definite fiber, which in this case proceeds from the cephalic ganglion (12).

There seems to be some disagreement between authorities concerning the histological structure of the nervous system of spiders. Thus Handstrom (10) states that spiders are specialized forms, lacking "globuli cells and a protocerebral bridge"; while Haller (9) insists that the globuli are much more distinct in spiders than in other arachnids! The globuli consist of groups of specialized cells which have been assumed, on purely morphological grounds evidently, to have an associative function—that is, they are shunts connecting the sensory with the motor cells. They appear to correspond roughly to the mushroom bodies of insects.

Like other arthropods, spiders have the bodies of the nerve cells (neurons) distributed in the periphery of the ganglionic mass (or masses); the core of the ganglion consisting chiefly of fibers from the cells. Also, like other arthropods, the arachnids have the sensory cells located ventrally and the motor cells dorsally.

The concentration of the nervous system of spiders is exactly what one might expect, considering the fact that these animals have no distinct head, and no visible abdominal segmentation.

II.

Sense Hairs.

All spiders possess hairs or spines, and in some species these are so numerous that the animal appears to "wear a fur coat." This is especially true of the tarantulas (Avicularoidea).

Some of these hairs are sensory (11). They greatly resemble the sensory hairs of insects, though being less specialized, they do not exhibit the variety of form found in those animals. Two distinct types are present in arachnids (18): long, movable hairs, and shorter, fixed hairs. Both Dahl (7) and McIndoo (18) state that the long hairs are especially numerous on the legs. Dahl (7, 8) considers them auditory, but it does not seem to me that he has fully demonstrated this to be the case. There can be no doubt that the hairs are very sensitive to contact; and this, for spiders, is a very important function, since many of them depend largely upon contact stimuli. Indubitably those species which regularly spin webs perceive vibrations by means of these hairs (2). One can scarcely consider such sensations auditory, although, since the distinction between felt vibrations and hearing is not great, it is often difficult to distinguish between the two.

Many observers have noticed that during courtship the movable hairs of spiders are erected.

III.

Lyriform Organs.

There is one group of sense organs peculiar to arachnids, and which are especially numerous on the bodies of spiders. These are the so-called lyriform organs or sensilla tomosa (14). They were first studied in detail by McIndoo (18), who described them as "flattened funnels, each communicating with a sense cell." Kaston (14) describes them in detail. According to him, each organ consists of a number of more or less parallel slits in the cuticular layer. The slits are separated by thick laminae, so that externally the organ somewhat resembles a grid. A thin layer of material covers the exposed surface, and a similar layer determines the inner limits of the organ. Below the cuticular part lie elongated, hypodermal cells and bipolar sense cells; one sense cell for each slit of the organ. A sensory fiber from the nerve cell traverses the slit between the membranes, which is filled with fluid. There are single as well as compound lyriform organs. The organs are variously distributed among different species of spiders, but this distribution has no taxonomic significance. Although especially numerous on the legs and palpi, lyriform organs are found on other parts of the body.

Various functions have been assigned to the sensilla tomosa. Both McIndoo and Kaston consider them chemical sense organs.

IV.

Eyes.

The distribution of various types among arthropods is peculiar. The crustaceans have only compound eyes, the arachnids (with the exception of ticks) have only ocelli, while insects have both. With the exception of those of house centipedes (which are compound), the eyes of myriapods are aggregations of ocelli.

Fundamentally the eyes of spiders do not differ structurally from the ocelli of insects. Each consists of: 1) a corneous, transparent, and usually colorless cuticular lens; 2) hypodermal cells with their long axes perpendicular to the surface of the eye; 3) accessory pigment cells; 4) a retinal layer comprised of the terminal fibers of sense cells. Between certain of the hypodermal cells rods (rhabdomes) are situated (4). There are certain variations between the histological structures of median and lateral eyes of spiders which we need not consider here. (See Widmann, 31.) Of greater interest is the fact that the median eyes of some spiders are equipped with muscles which, by producing horizontal and vertical rotation of the organs, are capable of bringing about a certain amount of accommodation (28, 32).

The number of eyes varies in different groups of spiders. Phalangids have but two; the greatest number found in any species is eight. There is also considerable variation in the development of the eyes themselves; Lycosidae and Salticidae being better equipped in this respect than other families.

V.

VISION.

A considerable amount of study has been devoted to the vision of spiders from the morphological standpoint. Scheuring (28) has determined instrumentally that the field of binocular vision is 50° for *Tegnaria atrica* and 80° for *Salticus scenicus.* These represent two extremes. The angle of *complete* vision is as much as 170°–180°. The angle of vision is not the same in all directions, even in a single species. Phalangids have a very limited angle of binocular vision (25°), which finds some compensation in their wide angle of complete vision (200° in all directions).

By measuring the refractive indices of the lenses and the number of rhabdomes stimulated, Petrunkevitch (23) decided that the angle of vision for *Phiddipus* is 8′, for *Lycosa* 60′ and for ourselves 1′. From this he concludes: "A creeping insect about 1 sq. cm. in size would be perfectly visible to the human eye at a distance of 3 m., while it would appear as a moving speck to *Phiddipus,* and would be totally beyond the range of vision of *Lycosa.*"

Of course this is not experimental proof in the real sense. In fact there seem to have been no careful and extensive experiments made on the vision of spiders. It is quite obvious, however, even from casual observation, that visual acuity varies remarkably between different species. Thus Petrunkevitch (24) observes that *Dugesiella hentzi* does not appear to notice even "a large object (such as the hand) in motion." The Peckhams (21) insist that most of the North American Attidae can see "small, immovable insects" at a distance of five inches, that they see larger insects at even greater distance, and recognize members of the opposite sex at least a foot distant.

As one approaches the "face" of an Attid spider with the end of a pencil or other similar object the animal "rears up" by elevating the cephalothorax, and walks backward. If one moves the object to one side of her, she quickly turns to face it. Blinded Attids do not behave in this way, and in fact become quite sluggish.

Dr. Wm. Barrows informs me that he has seen a captive specimen of *Dolomedes tenebrosis* seize successively eight houseflies on the somewhat slippery surface of a table. This behavior practically rules out every sense excepting visual space perception.

VI.

RESPONSES TO VIBRATION.

It has long been known that spiders respond to movements of their webs, even when the object that produces the vibration cannot possibly be detected in any other manner. In fact the spider may respond in this way to objects which have absolutely no value for her. The common garden spider, *Argiope* (*Miranda*) *aurantia*, will seize the tines of a vibrating table fork touched to her web. Barrows (2) states that *Epeira sclopeteria* orients to vibrations of this kind; and noting that while the smaller specimens react to higher vibrations (100 to 480 per sec.), the larger ones respond to the lower vibrations (127 to 284 per sec.); claims this to be an adaptation of the size of the spider to that of her prey.

Both Dahl (7) and the Peckhams (22) insist that these responses indicate the presence of an auditory sense. On the other hand Lecaillon (16) points out that even the spider's ability to distinguish differences in pitch does not prove the presence of audition, since such differences may be "felt" through the web. The only indication that an auditory sense may be involved is the fact that some spiders, when deprived of webs, and resting on a solid surface, still respond to air vibrations.

Wells (29), after experimenting on a number of species of *Epeira* and *Argiope* with a tuning fork (C1 28), found that a great variety of responses were given, not all of which were positive. Some specimens, for instance, dropped from the web; others shook the web; and some changed position.

Pirata piratica lives upon the surface of water, over which it runs (27). When an insect falls into the water, the spider quickly orients to the source of the vibrations produced, and runs in that direction until it encounters its prey.

VII.

THE CHEMICAL SENSES.

A number of experiments have been made to determine whether or not spiders possess olfactory and gustatory senses. The least satisfactory of these have been made with various essential oils (18, 22, 26); although the Peckhams noticed that the removal of the palpi of *Argiope riparia* interferes with responses to even these substances.

Considerable work of this kind has involved the mating reactions of spiders. Kaston (15), although he admits that certain species (*e.g., Dolomedes scriptus*) depend almost entirely upon chemical guidance in the selection of mates, believes that in such cases mechanical stimuli are also indispensable. Savory (27), although he makes no definite statement to that effect, seems to think that distance chemical stimuli are operative. He further states that spiders can locate water by the vapor which it gives off.

Bonnet (5) induced *Dolomedes* (sp.?) to accept bits of water-soaked cotton, which, however, were abandoned after a few minutes; but cotton saturated with meat juice was retained for several hours. Conversely, the spiders refused flies soaked in gasolene.

Argiope (Miranda) aurantia (1) is very sensitive to water, especially after being deprived of it for several hours. It will seize and drink from water-soaked cotton touched to any part of its body. It does not react in this way unless touched. But if a piece of cotton soaked in beef extract is brought *within 5 mm. of the palpi,* it is quickly seized. Sometimes this act follows extension of the palpi toward the substance. Moreover specimens deprived of palpi, or with those organs covered with shellac, pay no attention to the stimulus, although they sometimes move the chelicerae when it is brought near the legs. Similar reactions are exhibited by some other species.

It seems very likely that spiders do possess an olfactory sense, although this is probably neither very keen nor very well differentiated from what we generally consider gustatory. A somewhat similar condition obtains among insects.

Some spiders certainly respond to chemical stimuli from the opposite sex. Is it too much to expect such a sense to operate in the selection of food? Consider the fact that most spiders do not see nearly as well as insects, that web-builders are often deceived even by vibrations, and one is forced to suspect that the spider must at least have some means of distinguishing chemically between edible and inedible substances. This is further supported by the rejection by spiders of strong-smelling bugs and other insects.

VIII.

The Relation of the Senses to General Behavior.

We have already found that spiders are very sensitive to mechanical stimuli. Sometimes such responses take rather peculiar forms. Thus *Pholcus phalangoides,* according to Murphy (20), if touched as it hangs from a single thread, spins rapidly about for several seconds. Repeated stimulations produce a rapid increase, and then a decrease in the duration of the responses, and if continued, finally induce the spider to run away and hide. Petrunkevitch (24) states that the courting male of *Dugesiella hentzi* behaves as if "lost" the moment he loses contact with the female.

Especially curious is the behavior of the female spider toward her egg cocoon. Cocoons disguised to resemble other objects are not accepted by their owners, according to the Peckhams (21). On the other hand, spiders will acept as cocoon balls of cotton or other "fuzzy" objects. The female spider will accept the cocoon of another spider, but if she is kept from her own and all others for several days, will have nothing to do with any cocoon (17)! Odor as well as contact may influence the animal in such instances.

Chemical stimuli are certainly combined with contact in the mating of some spiders. Thus Kaston (15) was able to induce the courting reaction in *Dolomedes scriptus* simply by allowing the male to walk over a plate covered with the "washings" from a female of the same species. Mating appears to depend generally upon a combination of stimuli.

Spiders also exhibit a variety of responses to gravity, air-currents, differences in light intensity, etc. (27).

Certain generalized responses to light are exhibited by spiders. Of special interest is that observed by Montgomery (19) in the case of *Grammonota inornata,* a species living upon the seashore. If disturbed, this spider runs landward, excepting when the sun is directly overhead, at which time it may move in any direction. This is a negative response to light reflected from the water. Some spiders respond to any large object moving above them, by running in the opposite direction (27). The so-called responses of spiders to colors (22) are probably due to differential light intensity (27).

IX.

VARIATIONS IN BEHAVIOR.

The spider is not a machine, in spite of the efforts of some students to define its activities on this basis (27). This is amply demonstrated by the variations in the behavior of even the same spider upon different occasions. Berland (3) found that *Nemoscolous laurae* modifies the form of its web when confined. Both Wells (30) and Porter (25) emphasize the fact that such variations are numerous and easily observed.

Variations occur especially in the making of the web, method of feeding, mating, treatment of progeny, etc. Lecaillon (17) describes some of these peculiarities of behavior in detail. If a female *Theridium lineatum* is placed in the presence of several cocoons, she will bind three or more of them together. If two females of *Chiracanthium carnifex* are placed upon one web, they will each take possession of a part of it and defend it as her territory.

Porter (25) explains these variations in behavior by saying that, although they cannot be considered intelligent, they are adaptive in the sense that those most favorable are preserved. This seems to be a very sensible conclusion.

X.

Social Spiders.

Jambunathan (13) has called attention to the social habits of *Stegodyphus sarsinorum,* a spider indigenous to southern India. A number of spiders spin a large, communal web, having a central, more compact, place of retreat; the remainder of the web serving as a snare. A large insect is often shared as food by several spiders, and several members of the colony work together to repair or extend the web. Adult females have also been observed to leave prey they had captured to their young. Males and females inhabit the web in about equal numbers, apparently amicably. During the winter the walls of the inner refuge are thickened.

An editorial note appended to the above paper states that probably all species of *Stegodyphus* are communal, and that so also is *Uloborus republicans* of tropical America.

XI.

Concluding Remarks.

This paper has exhausted neither the literature concerning, nor the experimental possibilities of the senses and behavior of spiders. Indeed one of the outstanding facts is that there is really very little known concerning the whole matter. Although less complicated in structure and less diversified in form than insects, the spiders are by no means "simple animals." There are no simple animals.

I should like to append a few problems in spider psychology that are badly in need of investigation.

1. No one, so far as I am aware, has ever made experiments to determine the reflexes associated with the different parts of the arachnid nervous system.

2. A more careful study of the exact functions of the tastile hairs should be made.

3. Careful investigation should be made of the chemical senses, especially as concerns their location and manner of operation.

4. Responses of spiders to moisture should be greatly amplified.

5. Responses to vibration require further investigation; especially the possible effect of air vibrations alone.

6. Extensive experiments should be made on responses to differential light intensity and color, with a view to discovering whether or not these are distinct reactions.

7. Apparently no one has ever tested the space perception of Lycosids, Salticids, and other spiders with better developed eyes.

8. Some of the more obscure phases of spider psychology are awaiting discovery through more extended experiments on the responses of spiders to their egg cocoons.

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After this paper was prepared I encountered an interesting reference which should be included. This was published by H. Blumenthal in 1935 (Ztschr. wiss. Zool., 29, pp. 667–719). The author has demonstrated on the legs and palpi of both sexes of most of the species examined, microscopic pits, each bearing a conical prominence, and communicating with a sense cell. The organs are absent in the more primitive families of spiders (*e.g.*, Filistatidae Telemidae, etc.).

Spiders possessing the organs can detect the presence of a great variety of chemical substances in extreme dilutions: for example they distinguish between water and .7 per cent solutions of sugar, salt, and saccharine. Excision of the organs eliminates the responses.

THREE NEW SPECIES OF BROCHYMENA (PENTATOMIDAE) FROM THE UNITED STATES AND MEXICO.

By Herbert Ruckes, College of the City of New York,
New York City.

During examination of a number of different collections of the genus *Brochymena* several series were recently set aside as not conforming to already known species. The characters of these insects are such as to warrant the erection of new species for them. The following are the descriptions of these from collections of the United States National Museum, of the California Academy of Sciences, the private collection of Mr. H. G. Barber, of Washington, D. C., and the author's personal one.

Brochymena barberi, n. sp. (Fig. 1).*

Closely allied to *B. aculeata* Dist. but differs in several very important characters. Form broadly oval, sub-depressed; connexivum distinctly explanate; color dull yellowish gray to brown gray; head widest just in front of eyes then gently converging as far as the acute, large sub-apical teeth; in *B. aculeata* the sides are more nearly parallel; lobes of the juga extend beyond the tylus by about a distance equal to their width there; lobes are obliquely acute and tend to flare outward (Fig. 1-a), not truncated and straight as in *B. aculeata* (Fig. 1-e); disc quite densely nigro-punctate, the punctures tend to be elliptical rather than circular; a small tubercle, sometimes acute, just in front of each eye; surface of pronotum moderately undulant with the smooth areas about the calli rather small, long and thin, not rounded and embossed; punctures crowded, a pair of smooth, pale vermiculate markings at inner back corner of calli; antehumeral sinus quite prominent and disc there impressed; humeri quite rectangular and protrude prominently, their dorsal surfaces somewhat transversely rugose; each humerus terminates in a pair of prominent divergent teeth between which are two or three smaller ones (Fig. 1-a); a third large tooth occurs at the anterior basal border of the humerus; pronotal marginal teeth are four to five in number, are very long, narrow and very sharp; the basal third of the scutellum gibbose, its highest point well above the disc of the pronotum; a weak saddle between the lateral portions of this raised area, this bordered with a pair

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* The drawings of head and genitalia of *B. aculeata* were made by Mr. W. E. China of the British Museum to whom I am indebted for notes on Distant's type of that species.

of smooth, crescentic yellowish bars; four obscure fuscous bands of larger pits longitudinally across the gibbose area; median scutellar carina broad and not very high, the disc laterally somewhat depressed into a pair of shallow furrows; scutellar apex narrowly rounded, paler with fewer fuscous punctures in apical third; tip slightly upturned; elytra with punctures gradually congesting apically; basal fourth with evident smooth calloused pale areas; discal spot calloused and prominent; membrane hyaline with markings dark fuscous, the vermiculate ones between the veins quite large; connexivum alternated, with the pale band triangular in outline, the apex pointing inward; *posterior angles of, at least the first three visible, abdominal segments prominent and acute,* projecting strongly from the edge (Fig. 1-b); in *B. aculeata* these angles are not prominent, do not project and are rectangular; edge of buccula feebly sinuate ending in a sharp tooth; the frontal edge of the jugum is strongly sinuate (Fig. 1-c); in *B. aculeata* the buccular tooth is blunt and the frontal edge of the jugum is more nearly obliquely truncate (Fig. 1-f); the middle portion of the ventral thorax dull yellow with some scattered reddish fuscous punctures; the lateral half of the ventral thorax darker; the intercoxal darker blotches on mesosternum are continuous across the segment; the coxae, trochanters and basal third of femora dull yellow; distal two thirds of femora heavily spotted with deep fuscous, this forming a broad band apically, there interrupted with an incomplete annulus of pale; *fore tibiae dilated apically,* almost to the extent found in *B. haedula* and much greater than found in *B. aculeata;* ventral abdominal segments rather flattish, dull orange to yellow brown with scattered fuscous punctures which become darker fuscous laterally and there form some horse-shoe-like markings; rostral furrow shallow; beak long, reaching at least the front edge of the third visible segment; basal valves of female genital plates very convex; the posterior face of each *sharply declivent and deeply impressed;* a fuscous or reddish fuscous border reaches about halfway up the declivent face; intervalvular sinus deep and broad; male cup broadly oval in the outline with the claspers very distinctive, *the head of the visible lobe triangular in outline,* the apex pointing downward and the face slightly concave (Fig. 1-d); the claspers of *B. aculeata* are not triangular in outline but narrowly elongate somewhat like those of *B. haedula* (Fig. 1-g); the proctiger orange brown, its sides distinctly concave and a broad carinate ridge evident; this has an obtuse bend in it dorsally.

Size: Female: 14 mm. long; 8 mm. across humeri; $8\frac{1}{2}$ mm. across abdomen.

Male: 13½ mm. long; 8 mm. across humeri; 8½ mm. across abdomen.

There is close relationship to *B. aculeata* shown in the size of the pronotal and humeral teeth, the long juga, the general color and the outline of the male genital cup; the main differences are the sharp buccular tooth in *B. barberi,* the obliquely flaring juga, the sharp angulation of the abdominal segments, the dilated fore tibiae, the distinctly triangular outline to the posterior face of the male paramere.

Described from eight specimens, three males and five females.

Holotype: Female: Sonoita, Santa Rita Mts., Arizona. Collected by H. Ruckes, July 21st, 1937, and deposited in the American Museum of Natural History.

Allotype: Male: Sonoita, Santa Rita Mts., Arizona. Collected by H. Ruckes, July 21st, 1937. Author's collection.

Paratypes: Four females and one male in the collection of the United States National Museum, all from the Huachuca Mountains in Arizona and bearing no date labels. One male specimen in the H. G. Barber collection, this dated July 28, 1905, from the Huachuca Mts., Arizona.

Since writing this description, I have received specimens from the collection of the University of Kansas. I wish to add four paratypes to the list; two females, Sta. Rita Mts., Ariz.; July (F. H. Snow); one male, Huachuca Mts., Ariz., August 1, 1927 (P. A. Readio); one male, Sta. Rita Mts., Ariz.; August 18, 1935 (Beamer).

I take pleasure in naming this species after my friend, Mr. H. G. Barber, one of the leading American hemipterists of our time.

Brochymena barberi var. **diluta,** new variety.

Very similar to *B. barberi* but with sufficient difference in important characters to warrant being separated into a varietal category.

In var. *diluta* the principal characters defined for the species *barberi* are all present in a reduced form, *i.e.,* the color is lighter, the teeth shorter, the angulation of various parts more obtuse, etc.; hence the application of the term *diluta.* In var. *diluta* the lobes of the juga do not extend beyond the end of the tylus or if so by only a very small distance; the apex of the head before the teeth is less acutely triangular; the humeral teeth are not as long as in *B. barberi* and are more blunt; the posterior angles of the abdominal segments are distinctly not acute, tending to be more rectangular and even obtusely rounded; the basal area of the scutellum is raised but not gibbose, there is still a weak saddle between the halves; the frontal edge (side view) of each jugum is less sinuate and more nearly arcuate than in *barberi;* the ventral abdominal surface is more yellowish and the punctures are lighter; there is much more pale on the lateral portion of each abdominal segment and the characteristic horse-shoe-shaped marks on each segment are less distinct and may even be obsolete.

The male and female genitalia are identical with those of the typical *barberi;* since no other relatives in the genus, as now known, have these distinctive characters there is no question of relationship between this variety and the typical species. Since all the specimens, in the collection I have examined, are from Texas, this variety may be an eastern representative of the species.

Described from six specimens from western Texas.

Holotype: Female: Size 13½ mm. × 8½ mm.: Brownsville, Texas; June, 1901. Collection of Mr. H. G. Barber, Washington, D. C.

Allotype: Male: Size 12½ mm. × 7½ mm.: Brownsville, Texas; May, 1903. Collection of United States National Museum.

Paratypes: Brownsville, Texas, May, 1903; Brownsville, Texas, no date (both in the H. G. Barber Coll.) Esperanza Ranch, Brownsville, Texas, July 30th, 1931; Kerrville, Texas, June 19, 1908 (both in the U.S.N.M. Coll.).

I wish to add four more paratypes to this series, found in the University of Kansas collection. Two females, Hidalgo Co., Texas, August 14, 1928 (Beamer); one female, Brownsville, Texas, June (Snow); one male, Cameron Co., Texas, August 3, 1928 (Shaw).

Brochymena usingeri, n. sp. (Fig. 2).

Form broadly oval, somewhat depressed; venter not appreciably convex; color, medium fuscous with a tinge of reddish, shiny; diameter of the head in front of eyes slightly wider than distance from that line to apex of head; sides very slightly converging, the edges of the juga but weakly bent inward from edges of the head behind the subapical teeth; juga longer than the tylus and *exceeding it by about a length equal to the width of one jugum at that point; inner margins of the juga lobes parallel so that a conspicuous rectangular sinus appears between them* (Fig. 2-a); subapical teeth broadly triangular; distal half of tylus, apical lobes of juga and a third of the subapical teeth, *impunctate and pale;* punctations of the head irregular with a tendency to coalesce; pronotum with antehumeral sinus weak and inconspicuous, so that front edge of humerus and margin of pronotum are nearly a continuous line; front half of pronotal disc with irregular punctures, many coalescing into corroded areas about the calli; front half of disc provided with obliquely elongated, smooth, irregular island-like, raised, pale areas; posterior half of disc with rather regular and uniform circular nigro-fuscous punctures of medium size; *crest of each humerus with a prominent oblique smooth pale band;* just inside of this an oblique rugose band of broad, black punctures cuts across the shoulder; marginal pronotal teeth concolorus with the pale markings on head and pronotum; teeth four to seven in number with smaller ones interpolated between them; humeri with one or two minute crenulations at the most, otherwise edentate; the most striking character of this species lies in the *flat-topped nature of the raised basal portion of the scutellum, the whole surface appearing truncated* as in *B. affinis,* this region is suffused with reddish; the posterior surfaces of this raised portion become declivent and a broad median elevation, broader than a carina, extends to the apical third of the shield; the frenum ends posterior to the middle of the scutellar edge so that the apical tongue is short; punctures on the basal raised portion large, deep and irregular, tending to coalesce at the lateral thirds, there forming a broad, oblique corroded band just inside the basal corners and *separated therefrom by a narrow, oblique, smooth raised line of pale;* middle portion of scutellum with rather uniform shallow nigro-fuscous punctures of medium size; *punctures at the apical fifth suddenly become much smaller and more condensed;* elytral punctures small, shallow and regular, interspersed with numerous small irregular smooth points; membrane somewhat infused with deep orange brown, the veins and vermiculate markings darker reddish fuscous not outlined by a pale border of membrane; exposed edge of connexivum alternated with dull yellow and dark brown, punctures small and scattered; incisures between segments raised and pale; *posterior angles of abdominal segments inconspicuous and distinctly obtuse* (Fig. 2-b); edge of the buccula sinuate and ending in a prominent stout acute tooth which tends to be concave on its front edge (Fig. 2-c); basal antennal segment paler than the remaining four which are nigro-fuscous; segment two somewhat shorter than segment three; segment three, four and five subequal; fore tibiae stoutish and gradually dilating toward the apex; femora with fuscous maculations tending to coalesce into longitudinal vittae; a longitudinal pale stripe on front and back surfaces of the femora; a subapical incomplete pale annulus present, this most noticeable on the fore femora; tibiae annulated as in allied species; second joint of each tarsus pale above, other parts fuscous; metasternal evaporating area conspicuously pale with a contrasting dark auricle which ends acutely and *is well raised above the surrounding disc;* ventral abdominal color dull orange brown with a few widely scattered inconspicuous punctures, these most abundant laterally where they become darker and form horse-shoe-shaped designs near the edge of each segment; rostral groove long, broad and shallow the beak reaching at least the middle of the second visible segment; inner apical corners of basal valves of female genital plates reddish brown *together forming a dark narrow triangle in the middle of the genitalia;* narrow inner border of each basal plate slightly impressed, certainly not raised or reflexed; male genital cup with lateral corners quite prominent, not so prolonged as in *B. affinis* or *B. hoppingi* but longer than those of *B. quadripustulata;* upper surface of each male clasper broadly oval in outline, *the under surface provided with a high carina; the proctiger broad, sides convex, without a median keel of any kind;* the upper lip of the genital cup deep nigro-fuscous, provided with a pair of stout prominent spurs pointing in direction of claspers.

Size: Female: 17½ mm. long; 9½ mm. across humeri.
Male: 16¾ mm. long; 8½ mm. across humeri.

The form of the male claspers and the convex sides of the proctiger suggest affinity to *B. sulcata* Van D. and *B. affinis* Van D., though there is no deep sulcus across the posterior face of the cup nor are the corners of the cup extended; the general build is somewhat like that of *B. quadripustulata* though the juga are not so long and do not meet or overlap in front; the color is a yellowish fuscous suffused with reddish giving a lighter appearance than in that species; the surface of the body is quite faceted and shiny.

Described from nine specimens, seven females and two males all collected by R. L. Usinger (after whom the species is named) and H. E. Hinton.

Holotype: female, Tejupilco, Temascaltepec, Mexico. June 20, 1933. Museum, California Academy of Sciences.

Allotype: male, Tejupilco, Temascaltepec, Mexico. June 20, 1933. Museum, California Academy of Sciences.

Paratypes: Four females and one male from the type locality and dated June 20–29, 1933. One female from Rio de Arriba, Mexico, dated June 9, 1933. One female from Bejucos, Mexico, July 3, 1933.

Brochymena humeralis, n. sp. (Fig. 3).

Form broadly oval; color grayish yellow brown, shiny; not appreciably depressed and the dorsal surface faceted; the head as long before the eyes as wide just in front of them; sides of head converging to a subacute apex; subapical teeth not large, acute; the sinus acute; edges of the juga bend inwardly away from the margin of the head behind the subapical teeth; juga do not or only slightly extend beyond the tylus, their tips acute; apex of head narrowly triangular and subtruncate (Fig. 3-a); the most striking character of the species appears in the *protruding prominent humeri* (Fig. 3-a); the lateral margin of the pronotum has a *well defined and deep antehumeral sinus,* the front edge of each humerus meeting the long axis of the pronotum almost at right angles; the apex of the humerus is acute and slightly produced; a short, rugose band of black pits cuts obliquely across the base of each humerus; marginal teeth of pronotum four to six in number, small and irregular with smaller ones interpolated; front margin of humerus with three retrorse serrations, apex acute and smooth; punctures of pronotum mixed in size; a pair of irregular, longitudinal, short bands of deep, large black pits extends across the highest points of the posterior half of the pronotal disc; basal portion of the scutellum raised and quite convex but not tumid; punctures and pits of various sizes and mixed throughout; there is a band of deep corroded pits obliquely across each basal corner and some obsolescent dark, pitted vittae across the median third; the elevated portion continues posteriorly as a broad, short convex ridge, thicker than a carina; posterior half to two-thirds undulating; the frenum ends posterior to middle of scutellar edge and the apical tongue is rather short; elytral punctures large and fewer basally becoming gradually finer and coalescing apically; numerous substellate white points and reticulations scattered over the surface; a discal point prominent; membrane hyaline with a fulvous tinge; veins and vermiculate markings bright reddish brown and without pale membranous borders; connexivum alternated dull yellow and brown; some fulvous punctures in the yellowish band; incisures raised and pale; *posterior angles of abdominal segments prominently protruding and rectangular* (Fig. 3-b); edge of buccula *shallowly sinuate* and ending in a stout acute tooth, tending to have a concave front edge (Fig. 3-c); first and second antennal segments dull reddish brown, remaining ones darker brown becoming fuscous; segments two and three essentially subequal; segment four the longest; maculations of legs reddish brown to fulvous rather than fuscous, color design similar to allied species; fore tibiae stoutish slightly dilated apically giving a subclavate outline; metasternal evaporating area pale, orifice opens laterally; the crateriform base well elevated and auricle relatively short and dark and well raised above surrounding disc; ventral abdominal segments dull yellow with a scattering of rufous to fuscous punctures, pubescence sparse and silky pale; horse-shoe-shaped lateral designs on each abdominal segment obsolescent or inconspicuous; rostral groove long and shallow, beak reaching at least the front margin of the third visible segment; *inner narrow margins of the basal valves of the female genital plates very narrowly upturned or reflexed,* so that, when valves are tightly closed there appears to be a thin median carina between them.

Size: Female: 18 mm. long; 10 mm. across the humeri.

The species is somewhat like *B. quadripustulata* with its prominent rectangular angles on the abdominal segments; like *B. carolinensis* with its faceted dorsal surface and prominent humeri, which in *B. humeralis* are still more pronounced, like *B. cariosa* with its acute juga and compound carina-like ridge between the basal valves of the female genital plates.

Described from five specimens, all females, collected by R. L. Usinger and H. E. Hinton at Bejucos and Tejupilco, Temascaltepec, Mexico, June 29th to July 5th, 1933.

Type: Female, Bejucos, Temascaltepec, Mexico, July 2, 1933. Museum, California Academy of Sciences.

No allotype is now known.

Paratypes: four females, Tejupilco, Temascaltepec, Mexico, June 29th and July 5th, 1933; two deposited in Museum, California Academy of Sciences and two retained by the author.

Andrallus spinidens Fabricius in the U. S.—C. A. Hart, in 1919 (The Pentatomoidea of Illinois, Ill. Nat. Hist. Surv., Bull. XIII: 198) reported the capture of a specimen of this large asopine at Brownsville, Texas. However, in 1917 Dayton Stoner described "A New Species of Apateticus from Louisiana" (Ent. News, XXVIII: 462–463) under the name *Apateticus ludovicianus.* The description and the figure show clearly that the new species belongs in *Andrallus* Bergroth (*Audinetia* Ellenrieder), and not in *Apateticus* auctt.

The description and the figure of *Apateticus ludovicianus* indicate a form with prominent blunted humeral spines, while in *Andrallus spinidens* these are acute. But the pale apex of the scutellum and narrow border of the corium, together with the calloused impunctate transverse carina of the pronotum running between the humeri, are characteristic of the second named species.

At the moment, and in the absence of further authentic specimens from our Gulf States, it might seem best to synonymize *A. ludovicianus* Stoner with *A. spinidens* Fabricius. Should further similar specimens turn up, Stoner's name may stand for a second species of *Andrallus,* distinguished by the blunted humeral spines or processes.—J. R. DE LA TORRE-BUENO, Tucson, Arizona.

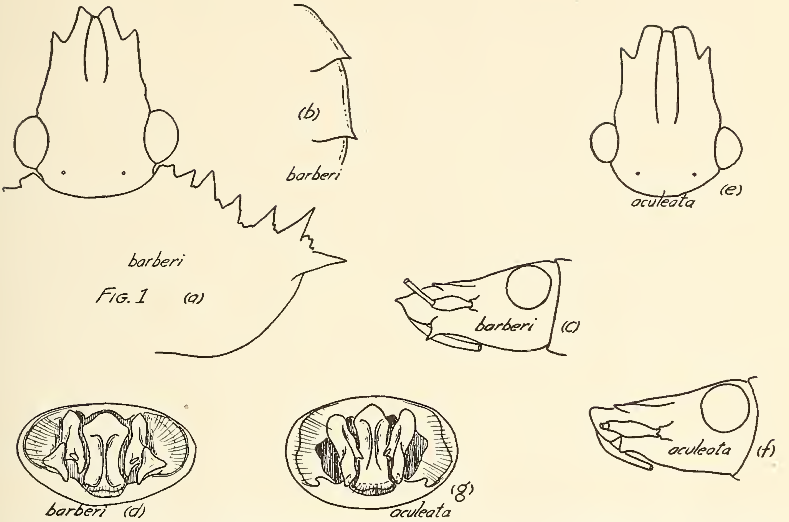
barberi
(b)
barberi
oculeata
(e)
barberi
(a)
barberi
(c)
aculeata
(f)
barberi
(d)
(g)
aculeata

FIG. 1

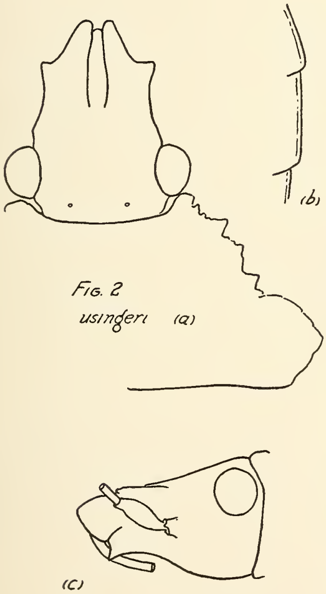
(b)
usingeri
(a)
(c)

FIG. 2

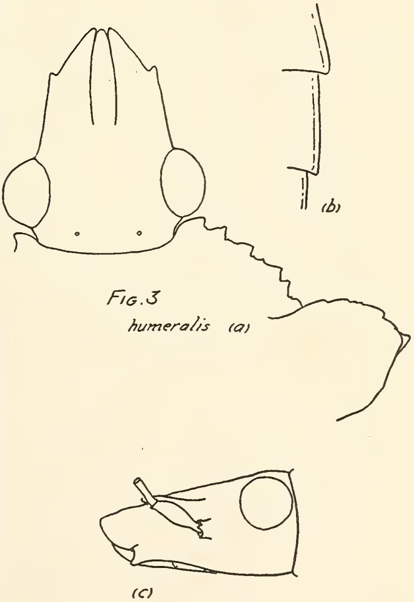
(b)
humeralis
(a)
(c)

FIG. 3

NEW FORMS AND SPECIES OF THE GENUS CATASTICTA—I (PIERIDAE: RHOPALOCERA).

By F. Martin Brown, Colorado Springs, Colo.

In making the first complete revision of any large genus of insects the revisor is faced by the problem of unnamed forms. This genus presents a particularly difficult problem in this respect since it seems to contain many very variable species. Whether the varieties of these are worth naming or will only add to the synonymy is always a question. I have used new names only in cases where they seem to be needed for a clearer picture of the group. This paper is devoted to the nova in the revision, now complete and awaiting publication. However, to facilitate the task of other workers I feel that publication now is warranted, particularly since publication of the final papers is still remote because of the great volume of the revision. All forms will be figured in the published revision. This first paper describes material from the author's collection and from the collections in the Zoological Museum, University of Berlin, Germany, and in the National Museum of Natural History, Paris, France.

Catasticta corcyra corcyra female form **linea**, n. form.

Upperside: This form differs from the normal female form, which is identical with the males in pattern and maculation, in the following respects: there is a narrow triangular extension of the dark costal line along the entire length of the discocellulars on the forewing; on the hindwings the nervules are lined with dark scales almost as far as the cell, there is a smudge of dark scales connecting the basad ends of these lines on the median-three and lower radial nervules; the terminals of the lines are greatly expanded into rounded smudges of dark scales on the margin; the dark outline of the entire wing is heavy.

Underside: These surfaces are normal.

Type locality: "Peru."

Repository of type: Zoological Museum, University of Berlin, Germany.

This variation is of the same type as *C. notha* f. *pieridoides* (Felder).

Catasticta prioneris hegamon female form **tincta**, n. form.

This form differs from the typical females in that the white pattern is replaced in bright yellow. It has the same relation to *hegamon* that *flava* Roeber has to *sisamnus pitana*.

Type locality: Cachi, Costa Rica.

Repository of type: United States National Museum, Washington, D. C.

Catasticta subflava form **collina**, n. form.

Male—Upperside: Differs in one respect from typical *subflava,* the basic light color is pure white and not pale yellow.

Underside: Identical in maculation with *subflava.* The color differences are the lack of yellow cast over the entire surface on both wings and the replacement of the bright yellow marks with very pale yellow.

Female—Upperside: Similar to the male. The chief difference is that the discal band of white is broader on both wings and free of dark scaling in the interspaces. The outer margin of the band on the hind wings is curved not straight as in the male. The limbal series on both wings is obsolescent.

Underside: as in the males.

Average length of the costal margin of the forewing: 24 mm. (21–25).

Type localities and repositories of the types:

Holotype male: Callanga, Cuzco, Peru, 1500 m.; Zoological Museum, University of Berlin, Berlin, Germany.

Allotype female: Rio Aguacatal, Cauca, Colombia 2000 m.; National Museum of Natural History, Paris, France.

Paratype males 1–3; same data as holotype.

Paratype male 4; Rio Madre de Dios, Peru, 2200 m.; National Museum of Natural History, Paris, France.

Roeber in the addenda to Seitz' Macrolepidoptera Volume V considers these specimens in the Staudinger Collection at Berlin to be *susiana.* Although close to that species their general appearance is sufficient to separate them. *Catasticta collina* is a Staudinger manuscript name.

Catasticta chelidonis form **teara**, n. form.

Upperside: This is a pale form of the stem-species. On these surfaces the rich ochre-yellow of the discal zone on *chelidonis* is reduced to buff. The basal dark area on the forewings is expanded slightly restricting the discal band. The nervules are a little more heavily marked than on the type of *chelidonis.*

Underside: The same general statement holds true for these surfaces. The light discal band on the forewing is almost white. The marginal series on the hindwing is produced inwardly somewhat reducing the pearly submarginal markings.

Type locality: San Jacinto, Bolivia, 2000 m.

Repository of the types:

Holotype male and two paratype males all with the same data in the Zoological Museum of the University of Berlin, Berlin, Germany.

The name applied is Staudinger's manuscript under which the specimens stand in the above collections.

Catasticta chelidonis female form **chelalba**, n. form.

In this form of the female the basic dull yellow color is completely replaced by white. On the underside of the wings the yellow streaks and dashes are very pale. One of the paratypes in the Berlin Museum is slightly lemon yellow, not pure white as is the type.

Type localities and repositories of the types:

Holotype: Pararonti, Chapare, Bolivia, February; coll. F. Martin Brown.

Paratypes: Marcapata, Peru, in National Museum of Natural History, Paris, France; Chaco, Bolivia, in Zoological Museum, University of Berlin, Germany; Rio Songo, Yungas, Bolivia, in Zoological Museum, University of Berlin, Germany.

Catasticta chelidonis female form **chelaura**, n. form.

In this form the yellow is replaced by bright orange on the upper surfaces. The underside has a distinct orange tone, possibly to some degree transmitted from the upper surfaces. All the pattern is intensified on the underside.

Type locality and repository of the type:

Holotype: Bolivia, in the Staudinger Coll. at the Zoological Museum, University of Berlin, Germany.

Catasticta suasa **feldera.**

Upperside: The maculation is as in *suasa* but much more distinct. This has been brought about by a marked reduction of the suffusion that all but completely obscures the lighter basic color on *suasa*. The light basic color is pale yellow, not white as it is on *suasa*.

Underside: Here the difference in basic color is more clearly seen. The discal band of the forewing of *feldera* is yellow buff and of *suasa* white. On the hindwings the brown marginings of the marginal series almost obliterate the pearly submarginal markings. This is not true of *suasa*.

Female—Upperside: At first glance there seems to be a marked difference between the sexes. However, this is due merely to the absence of suffusion across the discal band of the female. The light color is white, tinged with yellow toward the costal and the anal margins of the hindwings.

Underside: This is the same as in the males, with the discal bands only tinged with yellow.

Type localities and repositories of the types:

Holotype: male—Road between Cocopunco and Pararani, 10,000 to 5,200 feet, Bolivia, March 29, 1926; American Museum of Natural History, New York.

Allotype: female—same locality but taken March 26, 1926; American Museum of Natural History, New York.

Paratypes: males, 1 and 2—Rio Songo, Yungas, 1200 m., Bolivia; Zoological Museum, University of Berlin, Berlin, Germany.

The holotype and allotype were collected by Mr. G. H. H. Tate of the museum staff.

Catastica philomene form **philomelas**, n. form.

C. chelidonis Roeber not Hopffer, Seitz, Macrolepid. V, p. 71.

Male: This form of the species is easily separated from the normal form by the almost total lack of suffusion on the discal band on the upper side of the hindwings and the paler character of the yellow in the maculation on the underside. Roeber in Seitz' Macrolepidoptera Vol. V, page 71, confused this form with *C. chelidonis* Hopffer. The name I apply is the one that Staudinger used in manuscript form.

Type locality: Chaco, La Paz, Bolivia, 3–5000 m., Bolivia.

Repository of types: Holotype and five paratype males, all the same data, Zoological Museum, University of Berlin, Berlin, Germany.

Catasticta philomene punctata form **hypoleuca**, n. form.

This form bears the same relation to *punctata* that *philomelas* does to *philomene.* The discal bands are lighter in color and broader. The overscaling of dark color in these bands is greatly reduced giving them a distinctly white appearance rather than greenish as in *punctata.* On the underside the discal band of the forewing is white and a little broader than in *punctata* and the yellow maculations a little smaller.

Type localities and repositories of the types:

Holotype: male, Callanga, Prov. of Cuzco, Perú, 1500 m. Zoological Museum of University of Berlin, Germany.

Paratype: male, Rio Madre de Dios, 2200 m., Perú. National Museum of Natural History, Paris, France.

The name is one in Staudinger's manuscript found on the male type.

Catasticta philomene race **philodora,** n. race.

Upperside: Resembles closely the Bolivian form *philomene,* differing from it in having all of the lighter areas slightly larger. The dark limbal band on the hindwing barely encroaches upon the cell. The limbal spots are about twice as large as on *philomene,* and the marginal spots on the hindwing are much more evident.

Underside: These surfaces also resemble those of *philomene,* however, the yellow ground color seems to be a little darker, and all of the yellow spots, especially on the hindwing, much larger. There is also considerable yellow scaling in the apical region of the forewing.

Holotype: a male, Rio Blanco, Rio Pastazo watershed, Eastern Ecuador. 2,000 meters, April 10, 1936.

Paratypes: 1–14–same data as type. Collected between April 2, and May 1, 1936.
15–Baños, Ecuador. 2,000 meters. February 2, 1936.
16–same data. February 28, 1936.
18–19–Rio Pastazo watershed. 1,600 meters. Ecuador. April 2, 1936.
20–Guama, Rio Pastazo watershed. 2,500 meters. May, 1936.
21–Yungilla, Rio Pastazo, Ecuador. 1,800 meters. September 16, 1936.

All of the specimens were collected by Mr. William Clark-MacIntyre. They are in the coll. of F. Martin Brown.

Catasticta distincta form **ecuadora,** n. form.

Male—Upperside: This differs from typical *distincta* in the basic light color. In *distincta* this is pure white, in *ecuadora* pale yellow. This changes the general appearance so completely as to warrant a varietal name. In addition the anal angle of the hindwing is slightly produced, a character not found in *distincta.*

Underside: The maculation is as in *distincta.* A pale yellowish cast over these surfaces gives this form a warmer appearance than that of *distincta.*

Type localities:

Holotype: Rio Blanco, near Baños, Ecuador, 2,000 m., April 17, 1936.

Paratypes: 65 males, same locality, taken between April 2, 1936, and April 17, 1936.

There are over 100 additional specimens from Baños, 1800 m.; Abitagua, 1000 m.; Yungilla, 1800 m.; Viscaya, 2500 m. and Rio Pastazo 1600 m. Specimens from all points in the Rio Pastazo watershed were taken during April and May. These were collected by Mr. William Clarke-MacIntyre and are in the collection of F. Martin Brown. This form may be more closely related to *philone* than to *distincta.*

Catasticta philone ecuadora form **pastaza**, n. form.

Upperside: Similar to *ecuadora,* but the ground color is a bright orange yellow instead of canary yellow, as in the typical form. This is heavily overlaid with the dark scales of the pattern color. The limbal light spots are of a much lighter tone of yellow than the discal and basal area.

Underside: The difference in the basal color is readily recognized on this surface. In addition the limbal spots of the forewing are a little bit larger, decreasing the width of the dark inner margin of the limbal band. There seems to be slightly more of the light color in the cell and in the basal area than on the typical form.

Type locality: Rio Blanco, Rio Pastazo watershed, Eastern Ecuador. 2,000 meters. (Rio Blanco is about 8 miles from Baños, Tunguhuara.)

Holotype: A male taken April 14, 1936.

Paratypes: 1 and 2–same data as the type.
3 and 4–same data, except date which is April 10, 1936.
5 and 6–same data as the type; taken on April 17, 1936.
7–Santa Ana, Rio Pastazo watershed, Eastern Ecuador. 2,000 meters. June, 1936.
8–Viscaya, Rio Pastazo watershed, Eastern Ecuador. 2,000 meters. June, 1936.

All specimens were collected by Mr. William Clark-MacIntyre. This form seems to constitute about 15% of the specimens taken at this time of the year. The type is to be deposited at the American Museum of Natural History, New York City, and paratype one at the British Museum of Natural History, in London.

Catasticta tanoia, n. sp. ✓

Upperside: This surface presents the appearance of a miniature *sordida.* The limbal spots on the hindwing, although the same shape, are possibly a little clearer at their points.

Underside: This surface is quite different from *sordida* on the hindwings. The limbal dark band is extended based almost to the origin of the M_1 nervule, thus narrowing the discal band considerably. The dark marginings of the marginal series is heavy and not uniformly wide. It almost obliterates all of the pearly white submarginal scaling. The limbal series is conspicuous and situated in the outer half of the band. This allows all the inner half, perhaps a little more, to be very dark seal brown. The discal band is almost entirely taken up by the broad transverse yellow streaks. The basal dark areas extend to the origin of the R_s nervule and contains the usual yellow dashes. The basal red spots are small.

Length of costal margin of forewing: 24 mm.

Type: a male, Coroicio, Yungas, Bolivia, in the Staudinger collection in the Zoological Museum, University of Berlin, Germany.

The name is Staudinger's manuscript designation.

Catasticta flisa form **maya,** n. form.

Upperside: This form varies in the opposite direction from that taken by *dilutior.* The white scaling is greatly reduced. The marginal and limbal series of spots are absent. The discal band on the forewing is reduced to two obsolescent spots between the Cu_2 and the A_2 nervules.

Underside: Typical of the species.

Type: a male from Copán, Guatemala, in the National Museum of Natural History, Paris, France.

A few Mexican and Central American specimens that I have seen approach it.

Catasticta seitzi **zana.**

Upperside: This is almost identical with *zancle* Felder. The distinct inner margin of the limbal band on the hindwings usually reaches the Cu_1 nervule. This differs from *zancle* Felder, however, in the shape of the forewing which is the same as that of *seitzi.* It differs from *seitzi* in the great reduction of the overscaling on the hindwings and somewhat on the forewings. The limbal and the marginal series of spots are larger than on *seitzi.* The basic light color is ochre as on *seitzi,* not pale straw as on *zancle.*

Underside: This is identical with *seitzi* in shape and distribution of the maculation but is a little lighter in color.

Average length of the costal margin of the forewing: 24 mm.

Type localities and repositories of the types:

Holotype: male, Fusagasuga, Colombia, coll. of the author.

Paratypes: one male "Colombia" in British Museum of Natural History; one male "Colombia," one male Bogotá, in National Museum of Natural History, Paris, France; four males "Colombia" in Zoological Museum, University of Berlin, Germany; one male from type locality in Zoological Museum at Tring, England; one male, Muzo, Colombia, in Coll. of author; and over 150 specimens from various localities on the Rio Pastazo in Ecuador that are slightly more brilliant than the type—which may be due to aging of the type.

Catasticta cinerea form **dusca,** n. form.

Upperside: This form is characterized by great extension of the dark scaling on the nervules almost obliterating all light scaling on both wings. On the hindwings the limbal band reaches the origin of the M_1 and Cu_2 nervules. The inner margin of the band is almost straight.

Underside: The forewings are much darker than those of *cinerea* and the discal areas reduced. The limbal band on the hindwings is hardly differentiated into a light and dark portion. The limbal series of streaks of yellow is almost obliterated by dark overscaling.

Average length of costal margin of forewing: 29 mm.

Type and paratype localities and repositories: two males, Chaco, La Paz, Bolivia, 2000–3000 m., in the Zoological Museum, University of Berlin, Germany.

Catasticta semiramis form **palla,** n. form.

Upperside: Much lighter than the average run of *semiramis.* The discal bands are a little broader and the basal dark areas lighter. The pattern color is warm light chocolate brown instead of black-brown.

Underside: This is the same as in *semiramis,* but much warmer in tone because of the difference in pattern color.

Length of the costal margin of the forewing: 27 mm.

Type locality and repository: a female, Popayán, Cauca, Colombia, in the Zoological Museum, University of Berlin, Germany.

The form is a little larger than the normal females. It may be a full species but I doubt it. The type was taken by Stübel and bears an identification label "*Archonias zancle* Feld" in Weymer's manuscript. I have males approaching this form from the western part of Colombia and so do not designate this as a female form.

Catasticta apaturina form **citra,** n. form.

Upperside: On this form the discal bands are yellow, pale on the forewings and bright canary yellow on the hindwings.

Underside: The discal band of the forewings is white. On the hindwings the yellow markings are an intense canary yellow and broader than on the typical form. The basic light color is tinged with yellow.

Length of the costal margin of the forewings: 20 mm.

Type locality and repository: a male, Quiroz, Peru, 960 m., January, in coll. of author.

Catasticta quiroza, n. sp. ✓

Upperside: This is very much like the corresponding surface of *chrysolopha.* The shape of the wings is, however, distinct. The forewings are shaped as in *truncata,* cutting back deeply between the M_2 and M_3 and with a clipped appearance to the apex. The hindwings are strongly dentate on the nervules. The limbal series are less prominent than on most specimens of *chrysolopha.* The discal band on the forewing is rich orange, not bicolored as on *chrysolopha.*

Underside: This surface is marked as on *chrysolopha,* but the lines are a little heavier.

Average length of costal margin of forewing: 20 mm.

Type and paratypes: four males, Quiroz, Junín, Perú 960 m., in coll. of author.

FIVE NEW SPECIES OF MIRIDAE FROM TEXAS (HEMIPTERA).[1]

By H. G. Johnston, College Station, Texas.

Atractotomus flavotarsus n. sp.

Allied to *crataegi* Knight but distinguished by shorter rostrum, thicker antennal segments I and II in male, and the yellow tarsi.

Male. Length 2.6 mm., width 1.2 mm. Head: width .61 mm.; vertex .36 mm. Rostrum: length .96 mm., scarcely attaining posterior margins of intermediate coxae. Antennae: segment I, length .21 mm., greatest thickness .12 mm.; segment II, length .78 mm., greatest thickness .15 mm.; segment III, .65 mm., slender, yellowish brown; segment IV, .43 mm., dusky. Pronotum: length .56 mm., width at base 1.0 mm.

Color uniformly black, tarsi except apical segment and claws yellowish, apical half of anterior and intermediate tibiae yellowish, antennal segments I and II tinged with red. Membrane dusky, veins black. Densely clothed with black simple pubescence and intermixed with closely appressed, silvery-white, deciduous, scale-like pubescence on femora, dorsum and sides of body, the individual scales much narrower than on *crataegi*.

Female. Length 2.8 mm., width 1.44 mm. Head: width .7 mm.; vertex .39 mm. Antennae: segment I, length .21 mm., greatest thickness .09 mm.; segment II, length .83 mm., greatest thickness .08 mm.; segment III, length .65 mm., slender; segment IV, length .17 mm., slender. Pronotum: length .61 mm., width at base 1.18 mm. Somewhat more robust than male but color and pubescence very similar.

Holotype: male, May 22, 1932, College Station, Texas (H. J. Reinhard).

Allotype: female, taken with the type.

Paratypes: 16 males and females, May 26, 1932, College Station, Texas (H. J. Reinhard); 3 males and 1 female, April 4, 1928, Huntsville, Texas (H. G. Johnston), found breeding on *Houstonia angustifolia* which is, no doubt, the host plant.

Eustictus albomaculatus n. sp.

Allied to *knighti* Johnston, but differs in the absence of long hairs on tibiae, shorter rostrum and much larger eyes.

---

[1] Contribution from Entomology Department, A. & M. College of Texas, College Station, Texas.

Male. Length 5.9 mm., width 2.14 mm. Head: width 1.35 mm.; vertex .17 mm.; eyes large, dorsal width of an eye .61 mm., height .91 mm., almost reaching the buccula. Rostrum: length 2.7 mm., not reaching apex of posterior coxae. Antennae: segment I, length .78 mm.; segment II, length 2.19 mm.; segment III, length 1.13 mm.; segment IV, length .96 mm.; general color brownish with pale maculations. Pronotum: length 1.13 mm., width at base 1.97 mm., uniformly brown with a narrow white line on posterior margin.

General color reddish brown to dark brown; head, pronotum, apical third of corium, narrow outer edge of embolium, apex of cuneus and membrane dark brown; mesoscutum and scutellum often dark brown as the pronotum; basal half of cuneus opaque white, apex dark brown. Venter and legs red, apex of femora, tibiae, and often the genital segment dark reddish brown. Dorsum with scattered, rather uniformly spaced, long, erect, black hairs on pronotum, scutellum, and hemelytra except cuneus and embolium.

Holotype: male, May 20, 1930, Weslaco, Texas (J. C. Gaines), Paratypes: 1 male taken with type at trap light; 2 males, June 7, 1933, 2 males, June 30, 1935, 1 male September 10, 1935, Dimmit Co., Texas (S. E. Jones), at trap light.

Neoborus quercicola n. sp.

Distinguished by the robust oval form, convex frons and scutellum, short rostrum, and coloration. This species is distinctly intermediate between *Lygus* and *Neoborus* and differs from *Lygus* essentially in the shorter head, puncturation between the calli, and the male genitalia.

Male. Length 4.6 mm., width 2.14 mm. Head: width 1.18 mm.; vertex .39 mm.; frons distinctly convex, impunctate, basal carina distinctly sinuate, a small depressed area in front of carina on lateral margins of vertex, eyes large, oval, not compressed. Rostrum: length 1.27 mm., slightly surpassing hind margin of sternum. Antennae: segment I, length .43 mm.; segment II, length 1.5 mm.; segment III, length .52 mm.; segment IV, length .35 mm.; yellowish-brown clothed with short, fine pubescent hairs. Pronotum: length 1.18 mm., width at base 2.0 mm.; strongly convex, lateral margins not carinate, coarsely, deeply punctate, a few punctures between calli, calli smooth, shining, extending anteriorly to collar; scutellum rather strongly convex, sparsely, coarsely punctate.

General color yellow marked with red and brown. Pronotum yellow, calli shining black anteriorly, posterior half with four large brown spots separated by yellow rays; scutellum yellow with two large brown spots each side of median line on apical half; hemelytra somewhat translucent, clouded with red and reddish brown, a distinct brown spot on basal half of corium inside radial vein, apex of corium and embolium with irregular reddish to brown spot, cuneus somewhat translucent, marked with bright red principally on outer basal angle and inner apical angle, membrane dusky, veins pale; sternum with large brown spot; ostiolar peritreme yellow, episternum brown; abdomen with irregular brown spots on sides of segments and with reddish and brown spots on genital segment; legs yellow, tibiae with three reddish to reddish-brown bands, tarsi with apical joint and claws brown, middle and hind femora with broad brown median band. Clothed with fine, short, yellow hairs.

Female. Length 4.9 mm., width 2.3 mm. Head: width 1.2 mm.; vertex .48 mm. Antennae: segment I, length .43 mm.; II, 1.48 mm.; III, .52 mm.; IV, .35 mm. Pronotum: length 1.3 mm., width at base 2.2 mm. Slightly larger and more robust than male. Coloration and pubescence similar to male but color more yellowish, the reddish and brown areas less extensive.

Holotype: male, April 1, 1933, College Station, Texas (H. G. Johnston).

Allotype: Female, taken with the type.

Paratypes: 42 males and females taken with the types on live oak (*Quercus virginiana*) where the species breeds abundantly; 21 males and females, April 24, 1932, Sonora, Texas (S. E. Jones), light trap.

Neoborus rostratus n. sp.

Distinguished by the short antennal segment II which is scarcely equal to width of head through eyes, the long rostrum which slightly surpasses apex of hind coxae, and the lateral carinae of pronotum.

Male. Length 3.5 mm., width 1.57 mm. Head: width .83 mm.; vertex .30 mm.; tylus with black line on apical half which divides on basal half to form two divergent lines that extend upon frons where they become reddish brown, frons shallowly punctate, shining. Rostrum: length 1.48 mm., slightly surpassing apex of hind coxae, yellowish, apex black. Antennae: segment I, length .26 mm., yellowish with a brown line on dorsal surface; segment II, length .83 mm., covered with fine, golden pubescence, basal half yellow, apical half black; segment III, length .42 mm., black; segment IV (broken). Pronotum: length .87 mm., width at base 1.4 mm., rather finely, densely punctate, lateral margins with two subparallel yellow carinae that are especially prominent on apical half, disk yellow, calli with large brown spot on inner margin, posterior half with two more or less distinct, wavy, transverse, brown bands, narrow basal margin yellow. Scutellum strongly convex, coarsely punctate, narrow median line impunctate, yellow, a dark brown line each side of median line diverging to lateral margins before apex.

Dorsum practically glabrous, with very fine, inconspicuous golden hairs. Hemelytra yellowish brown with four oblique brown lines, cuneus principally pale with brown markings. Membrane dusky, veins pale somewhat tinged with brown. Legs pale, femora with irregular brown markings on basal half and two sub-apical brown bands, tibiae with narrow dorsal brown stripe, tarsi with apical segment and claws fuscous. Ostiolar peritreme yellow, episternum brown, finely, densely punctate.

Female. Length 3.28 mm., width 1.8 mm. Head: width .89 mm.; vertex .39 mm. Antennae: segment I, length .26 mm.; segment II, length .87 mm., incrassated, slender basal half yellow, practically glabrous, thickened apical half black, finely, densely pubescent; segment III, length .43 mm.; segment IV, length .30 mm. Pronotum: length 1.0 mm., width at base 1.5 mm. Slightly more robust and somewhat paler in color than the male, the brownish markings less extensive. Puncturation and pubescence very similar to male.

Holotype: male, April 26, 1937, Brownsville, Texas (H. J. Crawford).

Allotype: female, taken with the type.

Paratypes: one male and two females taken with the types on *Croton berlanderi*.

Neoborus maculatus n. sp.

Allied to *rostratus* n. sp. but distinguished by the more prominent pubescence, different color, and the lateral pronotal carinae.

Male. Length 3.3 mm., width 1.6 mm. Head: width .87

mm.; vertex .27 mm.; brown, tylus black; frons distinctly, transversely striate. Rostrum: length 1.4 mm., attaining hind margins of posterior coxae, yellow, apex dark brown. Antennae: segment I, length .24 mm., yellowish with brown line on dorsal surface; segment II, length .83 mm., dark brown, apex yellow; segment III, length .39 mm., dark brown, apex yellow; segment IV, length .30 mm., dark brown. Pronotum: length .87 mm., width at base 1.4 mm., rather finely, densely punctate, posterior half of disk with numerous, irregular, yellowish callosities, posterior margin smooth, yellowish, lateral margins distinctly carinate, calli shining black on inner margins. Scutellum rather strongly convex, yellow and calloused except median line on basal half, rather finely, densely punctate.

Dorsum rather uniformly, irregularly, spotted with yellow and brown, membrane black, veins yellow; hemelytra uniformly, finely, densely punctate, sparsely clothed with fine golden pubescence. Legs pale, apex of hind femora, tibiae, and apical segment of tarsi dark brown. Venter yellowish, pleura and short line on abdominal segments brown.

Female. Length 3.4 mm., width 1.9 mm. Head: width .87 mm., vertex .35 mm. Antennae: segment I, length .26 mm.; segment II, length .83 mm.; segment III, .43 mm.; segment IV, length .30 mm. Pronotum: length 1.0 mm., width at base 1.7 mm. Slightly more robust, but coloration, pubescence, and puncturation very similar to male.

Holotype: male, April 26, 1937, Brownsville, Texas (H. J. Crawford).

Allotype: Female, taken with the type.

Paratypes: one female taken with the types on *Croton berlanderi;* one male and one female, April 16, 1937, Brownsville, Texas (H. J. Crawford), also taken on *C. berlanderi.*

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BOOK NOTES

Check List of the Lepidoptera of Canada and the United States of America. Part I. Macrolepidoptera, by J. McDunnough. (1938. Mem. South. Calif. Acad. Sci., vol. I, pp. 1–272.)

The writer acknowledges his inability to pass on the controverted questions of terminology or synonymy in Lepidoptera, so many of which, to the uninitiated might appear to be born of conservative love or of radical prepossessions. However, there can be no question as to the competency of the author or of the surpassing utility of such a painstaking and laborious work. It is far easier to point out faults than it is to produce the faultless opus. In approaching such a work as this, it should always be borne in mind that life is a flux and that its processes constantly ebb and flow; and similarly with that product of nature, human thought. Were nature cast in an iron mould and we with it, our product would be changeless and dead. Which is true of every biological thought, idea or theory. So, we must expect, indeed, even welcome, stark disagreement with any of our productions.

As one more or less concerned with books and their use, after the List itself, the Index of nearly 100 pages is to us the next most important feature of Dr. McDunnough's list. Not alone is it helpful in the extreme to enable the user to locate any wanted name, but it is also preeminently a task of exactness to be fully appreciated only by those who have done similar work.

Whether lepidopterists agree or not in its larger conclusions, this Check List is obviously one of those important books without which a working library is incomplete.

The Naturalists Directory, by S. E. Cassino. (1938. 31st Edition. The Cassino Press, Salem, Mass. $3.00, postpaid.)

This useful Directory is too well known to American entomologists to need more than a mere mention of its new edition. This 31st edition lists about 5200 interested workers from the United States and foreign countries. In fact, it becomes a guide for those that want to get in touch with people of similar interests throughout the world—a necessary work for natural history students and biological workers, especially entomologists. J. R. T.-B.

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BULLETIN

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DESCRIPTIONS AND RECORDS OF NEW WASPS FROM NEW YORK STATE (HYM.: SPHECIDAE).

By Karl V. Krombein, Buffalo, New York.

During the last four years I have had an opportunity to examine a large number of Sphecid wasps collected in New York by John G. Franclemont, Henry K. Townes, Harvey I. Scudder, LaVerne L. Pechuman and myself. Our collecting has brought to light several new species and a number of genera and species previously not recorded from the state and also has furnished a few records for species which were known from "N. Y." only in the State List.[1] I have followed the arrangement of genera in the State List but in several cases have used different generic names as indicated in the main portion of this paper. The genera marked with an asterisk are new to the state.

Tribe ASTATINI.

Astata Latreille.

A. nubeculus Cresson. Forest Lawn, Buffalo, Aug. 5 (KVK); Niagara Falls, July 20 (KVK); Warrendale, Grand Island, July 24 (KVK; on *Daucus carota*); Ellicott Creek, Tonawanda, Aug. 6 (KVK; on *Sium cicutaefolium*); Breesport, July 5 (HIS; on honey-dew of *Myzis ribis* on currant); Chafee, Aug. 1–5 (JGF); Minetto, gravel pit, Oswego Co., July 25–26 (KVK); Granby Center, sand dunes and swamp, Oswego Co., June 20–Sept. 4 (KVK); Oswego, Aug. 8 (KVK); Lake Sebago, Bear Mt. Park, Aug. 30 (HKT); Farmingdale, L. I., Aug. 28 (KVK).

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[1] 1928. Leonard, M. D., *et al.* A List of the Insects of New York. Cornell Univ. Agr. Expt. Sta., Memoir 101.

JUL 27 1939

* *Diploplectron* Fox

Diploplectron peglowi sp. nov.

Male: 5 mm. long. Black: palpi, anterior margin of clypeus, scape, apices of pedicel and first two flagellar segments, pronotal tubercles, tegulae and axillary sclerites, and legs entirely except for portions of all coxae and the hind femur above, light ferruginous; mandibles except apices, clypeus almost entirely, a spot on each side of front just above the clypeus and a narrow line on the anterior margin of the neck, creamy-white. Head, thorax and abdomen with sparse, erect white pubescence.

Wings yellowish hyaline, the marginal and appendiculate cells of the forewing somewhat infumated, the hind wing with a large dusky spot apically; nervures dark brown basally and testaceous apically.

Head shining and moderately punctured; the front subshining, shallowly punctured and shagreened; vertex and temples sparsely punctured and shagreened; clypeus with two median teeth separated by a semicircular emargination; a faint impressed line from clypeus halfway to anterior ocellus; antennae setaceous, joints three and four subequal, the last joint rounded apically and longitudinally grooved below.

Thorax shining and sparsely punctured; pronotum with delicate transverse striae; mesonotum more sparsely punctured posteriorly; scutellum practically impunctate; dorsal surface of propodeum finely granular with a median longitudinal reticulated sulcus terminating anteriorly in a slightly wider transverse reticulate area.

Abdomen shining and impunctate except along the posterior margin of each segment.

Female: 6 mm. long. Differs from male as follows: white markings entirely lacking; last antennal segment flattened below; dusky spot lacking in hind wing; clypeus with four teeth, the lateral pair small and indistinct; mesonotum almost impunctate; sides of propodeum obliquely striate.

Male paratypes differ in length from 5–7 mm. One specimen has no reticulated areas on the dorsal surface of the propodeum. The last segment of the antennae varies from longitudinally sulcate to merely flattened and it is quite likely that there is some post-mortem change here.

Female paratypes vary in length from 5–6.5 mm.

Holotype: 1 ♂, Granby Center sand dunes, Oswego County, New York, September 4, 1936 (K. V. Krombein). (Academy of Natural Sciences of Philadelphia, Type no. 4188.)

Allotype: 1 ♀, Granby Center sand dunes, Oswego County, New York, September 4, 1936 (K. V. Krombein). (Academy of Natural Sciences of Philadelphia.)

Paratypes: 1 ♂, Granby Center sand dunes, Oswego County, New York, August 26, 1936 (K. V. Krombein); 6 ♂♂, 4 ♀♀, Granby Center sand dunes, Oswego County, New York, September 1, 1936 (K. V. Krombein); 12 ♂♂, 5 ♀♀, Granby Center sand dunes, Oswego County, New York, September 4, 1936 (K. V. Krombein); 6 ♂♂, 1 ♀, Granby Center sand dunes, Oswego County, New York, September 5, 1936 (K. V. Krombein).

The August 26 specimen was taken at 4 P.M.; the Sept. 1 specimens at 11 A.M., 1:15, 1:30, 1:50, 2:30, 2:45, 3:05, 3:10, 3:35 and 3:55 P.M.; the Sept. 4 specimens at 9:45 (♀), 9:55 (♂), 10:35 (♂), 11:25 (♂), 11:40 A.M. (♂), 2:20 (♀ burrowing in sand), 2:25 (♂), 2:27 (♂), 2:28 (♂), 2:40 (♀ burrowing in sand), 2:50 (♂), 2:55 (♂), 3:00 (♂), 3:05 (♀), 3:10 (♂), 3:25 (♂), 3:30 (♂), 3:55 (♂) and 4:23 P.M. (♀ burrowing in sand); and the Sept. 5 specimens at 10:20 (♀), 10:25 (♂), 10:35 (♂), 11:10 A.M. (♂), 2:05 (♂), 2:20 (♂) and 3:00 P.M. (♂).

All specimens were taken on sandy knolls sparsely covered with grass except one which was caught on the sand damp from an early morning shower. The species evidently constructs its burrows in the sand since three females were taken while burrowing. The males appear to spend most of their time hunting around in the grass probably for the females. Both sexes are difficult to catch as about every other one hides in the grass rather than flying upward into the net.

The species is named in memory of the late Mr. Henry P. Peglow of Oswego, New York, who was my companion on many collecting excursions in Oswego County. So far as I know this is the first *Diploplectron* recorded from east of the Mississippi River.

Male and female paratypes have been deposited in the collections of Cornell University, the U. S. National Museum and the American Museum of Natural History.

During a recent visit at the U. S. National Museum I had an opportunity to examine the types of the species of *Diploplectron* described by Ashmead[2] and Rohwer[3] and the following notes and key will aid in the identification of species of this genus.

D. florissantensis Roh. [p. 122] belongs in the genus *Astata* Latr.

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[2] 1899. Ashmead, W. H. Ent. News, X: 55–56.

[3] 1909. Rohwer, S. A. Trans. Am. Ent. Soc., XXXV: 120–124.

as in the forewing the second submarginal cell receives both recurrent nervures and the marginal cell is more than twice as long as broad.

D. fossor Roh. [p. 120–121] is a synonym of *D. foxii* Ashm. [p. 56]. Eventually these species may prove to be identical with *D. brunneipes* (Cress.) [Proc. Ent. Sect. Acad. Nat. Sci. Phila., p. iii, 1881].

D. rufoantennatus Roh. [p. 120] is identical with a male "type" (probably a co-type) of *D. brunneipes* (Cress.).

D. ferrugineus Ashm. [p. 56] has two median teeth on the clypeus and runs to *D. ashmeadi* Roh. [p. 122] in Rohwer's key [p. 124] and Rohwer's species probably will turn out to be the opposite sex of Ashmead's species.

D. bidentatiformis Roh. [p. 121] is identical with *D. bidentatus* Ashm. [p. 56]. Ashmead was mistaken in the sex as the type of his species is a male and not a female as he states.

D. relativus Roh. [p. 123] is identical with *D. cressoni* Roh. [p. 123]. Rohwer made an error in stating that the clypeus of *cressoni* was rounded and without teeth since there is a very distinct pair of median teeth.

KEY TO THE NEARCTIC SPECIES OF *Diploplectron*

1. Antennae with twelve segments; abdomen with six segments; females 2
   Antennae with thirteen segments; abdomen with seven segments; males 5
2. Apex of posterior wing with an infumated spot
   ferrugineus Ashmead
   Apex of posterior wing without such a spot 3
3. Head, thorax and abdomen nearly entirely ferruginous
   cressoni Rohwer
   Head, thorax and abdomen black, or nearly entirely so 4
4. Median portion of clypeus with four small teeth
   peglowi sp. nov.
   Median portion of clypeus with only two small teeth
   brunneipes (Cresson)
   foxii Ashmead
5. Head and thorax usually entirely ferruginous, abdomen black
   ferrugineus Ashmead
   Head, thorax and abdomen usually black 6
6. Antennae ferruginous; pronotal tubercles creamy white
   brunneipes (Cresson)
   Antennae black; pronotal tubercles ferruginous or black 7

7. Median teeth on clypeus large; third submarginal cell wider below than above . . . . *bidentatus* Ashmead
Median teeth on clypeus smaller; third submarginal cell as wide above as below . . . . **peglowi** sp. nov.

Tribe LARRINI

Tachysphex Kohl

T. minimus (Fox). Roslyn, L. I., July 10 (KVK; on *Daucus carota*).

Tribe DINETINI

* *Miscophus* Jurine

M. americanus Fox. Granby Center, sand dunes, Oswego Co., Sept. 1–4 (KVK); Farmingdale, L.I., July 4 (KVK).

Solierella Spinola

(Subgenus *Silaon* Piccioli)

Solierella (Silaon) arenaria sp. nov.

Female: 5 mm. long. Black: mandibles with the apices red; posterior margin of pronotal tubercle, small spot at apex of fore and middle femora and at base of hind tibia, white. Head, thorax and abdomen with appressed silvery pubescence.

Wings hyaline, the forewings very slightly infumated apically; nervures brown. In the forewing the basal and transverse median nervures are interstitial and the first recurrent is received by the first submarginal cell near the apex.

Head opaque, puncturation close and granular on the front, somewhat sparser on the vertex; clypeus with a low shining tubercle which is sparsely punctured, the anterior margin produced into a rounded lobe medianly; an obscure longitudinal ridge from the clypeal tubercle to the V-shaped upper portion of the front which is formed by the deeply excavate antennal fossae; a shallow poorly defined furrow reaches from the apex of the V-shaped upper portion of the front to the anterior ocellus; postocellar distance twice as great as the ocellocular distance; antennae not clavate, the flagellar joints more or less subequal in length.

Thorax opaque and closely punctured, the metapleura shining and impunctate; triangular area of dorsal surface of propodeum with a distinct median, longitudinal raised line, elsewhere with striae; posterior surface of propodeum with transverse striae; lateral surface with fine longitudinal striae; anterior coxa with a stiff, differentiated hair apically.

Abdomen subopaque with fine, rather close puncturation; pygidial area convex and poorly defined, its lateral limits probably defined by a faint sulcus on each side.

Male unknown.

Holotype: 1 ♀, Granby Center sand dunes, Oswego County, New York, September 4, 1936 (K. V. Krombein). The unique type is retained in my collection.

This species belongs to the *chilensis* group and is probably closest to *kansensis* (Williams) from which it may be separated by the following couplet:

Disk of propodeum with a prominent, median longitudinal raised line and elsewhere with irregular, weaker striae; pygidium present although poorly defined; second recurrent nervure in the forewing received in about the middle of the second submarginal cell .... **arenaria** sp. nov.

"Disc of propodeum with a well-marked broad apical sulcus, and with a few short or indistinct striae from the base . . ."; pygidium absent; second recurrent nervure received near the tip of the second submarginal cell ..... *kansensis* (Williams)

From *S. niger* (Rohwer) which has been recorded from New York it differs in color, the presence of a furrow from the anterior ocellus and in the punctate abdomen. From *S. plenoculoides* (Fox) also recorded from this state, it differs in wing venation, lacks the carinate pronotum, the eyes do not converge as much at the vertex and the distance between the anterior and posterior ocelli is less than the distance between the posterior ocelli.

Tribe PSENINI

Diodontus Curtis

D. sulcatus Malloch. Jamestown, July 23 (C. Tongyai); Breesport, July 4 (HIS; on currant aphids); Ithaca, June 23 (KVK); Poughkeepsie, Aug. 2 (HKT).

Psen Latreille

(Subgenus *Psen* Latreille)

P. erythropoda Rohwer. Ithaca, Aug. 9 (JGF).

(Subgenus *Mimumesa* Malloch[4])

P. canadensis Malloch. Granby Center, sand dunes, Oswego Co., Sept. 4–5 (KVK).

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[4] Several species in the State List recorded under *Mimesa* Shuckard belong in this subgenus which has been segregated recently by Malloch.

P. mellipes Say. Roslyn, L. I., July 5 (KVK).

Tribe PEMPHREDONINI

* *Spilomena* Shuckard

S. pusilla Say. Millwood, June 20 (JGF).

* *Xylocelia* Rohwer

X. bidentatus (Rohwer). Forest Lawn, Buffalo, June 30–July 4 (KVK); Chafee, Sept. 13 (JGF); Ithaca, June 6–25 (KVK, JGF); Minetto, Oswego Co., July 31 (KVK).

X. virginiana (Rohwer). Forest Lawn, Buffalo, June 12–July 13 (KVK).

Xylocelia franclemonti sp. nov.

Female: 5.5 mm. long. Black; mandibles except apices, pronotal tubercles, apices of fore and middle femora, fore and middle tibiae entirely, base of hind tibia and fore tarsi, honey yellow. Head, thorax and abdomen with sparse, appressed pubescence.

Wings hyaline, the nervures testaceous.

Head opaque; puncturation closer on front than vertex; clypeus shining, apically with three sharp median teeth; a small tubercle on front just above antennae.

Thorax opaque; pronotum with fine longitudinal striae; mesonotum and scutellum shagreened, moderately closely and evenly punctured; dorsal and posterior surfaces of propodeum reticulate, the lateral surface obliquely striate; upper portion of mesepisternum reticulate; metapleura shining and impunctate.

Abdomen subshining, with numerous minute punctures; pygidium shagreened with several large punctures.

Male: 4 mm. long. Differs from female as follows: small spot at apex beneath of antennal segments four to twelve inclusive and the hind tibia entirely, yellow; clypeus and lower portion of front with dense, appressed silvery pubescence; clypeus with two rounded median teeth.

Female paratypes vary in length from 4–6 mm. and the hind tibia may be almost entirely yellow. The color varies from yellow to almost ferruginous.

Male paratypes vary in length from 3–5 mm. and the third antennal segment may also have a yellow spot at the apex beneath.

Holotype: 1 ♀, Forest Lawn, Buffalo, New York, August 17, 1934 (K. V. Krombein). (Academy of Natural Sciences of Philadelphia, Type no. 4189.)

Allotype: 1 ♂, Forest Lawn, Buffalo, New York, June 12, 1935 (K. V. Krombein). (Academy of Natural Sciences of Philadelphia.)

Paratypes: 3 ♂♂, Forest Lawn, Buffalo, New York, June 12, 1935 (K. V. Krombein); 1 ♂, Forest Lawn, Buffalo, New York, June 23, 1934 (K. V. Krombein); 2 ♀♀, 2 ♂♂, Forest Lawn, Buffalo, New York, June 30, 1934 (K. V. Krombein); 1 ♀, Forest Lawn, Buffalo, New York, July 11, 1934 (K. V. Krombein); 3 ♀♀, Forest Lawn, Buffalo, New York, July 13, 1934 (K. V. Krombein); 1 ♀, Forest Lawn, Buffalo, New York, July 30, 1934 (K. V. Krombein); 2 ♀♀, Forest Lawn, Buffalo, New York, August 15, 1934 (K. V. Krombein); 1 ♀, Forest Lawn, Buffalo, New York, August 16, 1934 (K. V. Krombein); 6 ♀♀, Forest Lawn, Buffalo, New York, August 17, 1934 (K. V. Krombein); 2 ♀♀, Forest Lawn, Buffalo, New York, September 20, 1934 (K. V. Krombein); 2 ♀♀, Forest Lawn, Buffalo, New York, September 20, 1936 (K. V. Krombein); 6 ♀♀, Forest Lawn, Buffalo, New York, September 21, 1934 (K. V. Krombein); 6 ♂♂, Ithaca, New York, June 6, 1935 (K. V. Krombein); 1 ♂, Ithaca, New York, June 13, 1935 (J. G. Franclemont); 3 ♂, Ithaca, New York, June 13, 1937 (J. G. Franclemont); 1 ♂, Ithaca, New York, June 15, 1935 (K. V. Krombein; on *Chrysanthemum leucanthemum*); 1 ♂, Ithaca, New York, June 15, 1935 (K. V. Krombein); 1 ♂, Ithaca, New York, June 16, 1935 (K. V. Krombein); 1 ♀, 2 ♂♂, Ithaca, New York, June 25, 1935 (K. V. Krombein); 1 ♀, Ithaca, New York, June 26, 1935 (K. V. Krombein); 1 ♂, Minetto gravel pit, Oswego County, New York, July 11, 1936 (K. V. Krombein); 2 ♀♀, Minetto gravel pit, Oswego County, New York, July 25, 1936 (K. V. Krombein); 1 ♂, Minetto gravel pit, Oswego County, New York, July 26, 1936 (K. V. Krombein); 1 ♀, Minetto, Oswego County, New York, July 19, 1936 (K. V. Krombein; on burdock leaf with aphids); 1 ♀, Minetto, Oswego County, New York, August 27, 1936 (K. V. Krombein; on burdock leaf with aphids); 1 ♀, Granby Center sand dunes, Oswego County, New York, September 1, 1936 (K. V. Krombein); 1 ♂, Granby Center sand dunes, Oswego County, New York, September 4, 1936 (K. V. Krombein); 1 ♀, Granby Center sand dunes, Oswego County, New York, September 5, 1936 (K. V. Krombein); 1 ♂, Yonkers, New York, July 28, 1937 (L. L. Pechuman); 1 ♀, Westerly, Rhode Island, July 2, 1935 (M. Chapman).

Female and male paratypes have been deposited in the collections of Cornell University, the U. S. National Museum and the American Museum of Natural History.

X. franclemonti sp. nov. is named in honor of Mr. John G. Franclemont. It is probably most closely related to *X. bidentatus* (Rohwer). The three species occurring in New York may be separated by the following key:

1. Mandibles and prothoracic tubercles black; mesonotum shining, anteriorly rather closely punctured, posteriorly very sparsely so; size large .... *virginiana* (Rohwer)
   Mandibles and prothoracic tubercles yellow; size smaller 2
2. Mesonotum subopaque, rather closely and evenly punctured on the entire surface; females with fore and middle tibiae and occasionally the hind tibiae also, yellow; males with antennal segments four or five to twelve inclusive with a yellow spot at the apex beneath ... **franclemonti** sp. nov.
   Mesonotum shining, closely punctured on the anterior portion, posteriorly very sparsely punctured; females with fore tibia only yellow; males with the antennal segments entirely black .... *bidentatus* (Rohwer)

Tribe NYSSONINI

**Lestiphorus* Lepeletier

L. mellinoides (Fox). Troy, Aug. 26 (HKT).

Nysson Latreille

(Subgenus *Epinysson* Pate)
(=*Brachystegus* of State List)

N. opulentus Gerstaecker. Minetto, gravel pit, Oswego Co., July 26 (KVK); Bohemia, L. I., June 20–July 25 (KVK); Farmingdale, L. I., July 4 (KVK).

Tribe CRABRONINI

(*Soleniini* of State List)

Solenius Lepeletier

S. aciculatus (Provancher). Forest Lawn, Buffalo, June 9–Sept. 19 (KVK); Buffalo, July 10 (JGF); Lockport, July 10 (LLP); Wilson, Aug. 27 (KVK; on *Eupatorium perfoliatum*); Frontenac Point, Lake Cayuga, July 22 (JGF); Ithaca, June 11–Oct. 15 (KVK & JGF); Minetto, Oswego Co., Aug. 11–13 (KVK); Oswego, July 5 (KVK).

S. texanus (Cresson). Roslyn, L. I., July 10–Aug. 7 (KVK; on *Daucus carota*).

Crabro Fabricius

(*Solenius, pars* of State List)

C. pleuralis Fox. Oswego, July 26 (KVK).

C. discretus Fox. Ithaca, June 15 (HIS).

C. tenuis Fox. Smithtown, L. I., June 20 (KVK); Roslyn, L. I., June 30 (KVK).

C. tenuiglossus Packard. Ithaca, June 11 (HKT).

C. plesius (Rohwer). Forest Lawn, Buffalo, June 21–July 13 (KVK); Chafee, Sept. 12 (JGF); Breesport, July 5 (HIS; on honeydew of *Myzis ribis* on currant); Ithaca, May 31–June 6 (KVK, HIS); North Fairhaven, Aug. 11 (KVK); Minetto, Oswego Co., Aug. 28 (KVK); Granby Center, swamp, Oswego Co., June 28 (KVK); Pelham Park, New York City, June 29 (LLP).

C. lentus Fox. Forest Lawn, Buffalo, June 21–Aug. 17 (KVK).

C. tarsalis Fox. Millwood, June 28 (HKT).

C. davidsoni Sandhouse.[5] Forest Lawn, Buffalo, June 21–23 (KVK); Rome, June 17 (HKT); Ithaca, Aug. 30 (HIS); Breesport, July 25 (HIS; on currant aphids); Granby Center, swamp, Oswego Co., Aug. 26 (KVK); Poughkeepsie, July 18 (HKT); Yonkers, July 28 (LLP).

* *Lindenius* Lepeletier

L. buccadentis Mickel. Bohemia, L. I., June 20–July 25 (KVK); Farmingdale, L. I., July 1–Sept. 12 (KVK).

L. errans (Fox). Forest Lawn, Buffalo, July 2 (KVK); Ithaca, June 25–Aug. 3 (HIS, KVK); Granby Center, sand dunes, Oswego Co., June 20–Sept. 5 (KVK); Yonkers, July 10 (LLP).

L. zellus (Rohwer). Hancock, Aug. 3 (HKT).

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[5] This species was described only recently by Miss Sandhouse [Ann. Ent. Soc. Amer., XXXI: 1–4, 1938] who had one specimen from Rochester, New York, in her type series. It is quite likely that some of the specimens listed under *ater* and *cinctipes* in the State List may have been misidentified since the three species are superficially quite similar.

OBSERVATIONS ON THREE SPECIES OF TRIATOMA (HEMIPTERA: REDUVIIDAE).

By Lawrence Paul Wehrle,
University of Arizona, Tucson, Arizona.

Introduction.

The assassin bugs (Reduviidae) or cone-nosed bugs of the genus *Triatoma* occur in the Southwest where they are of considerable importance. At least three species of *Triatoma* occur in the Tucson area. These are *Triatoma protracta* Uhler, *Triatoma uhleri* Neiva, and *Triatoma longipes* Barber.

Triatoma protracta is uniformly black in color and rather small, being about 18 mm. long.[1] (See figure.) This species occurs in the vicinity of Tucson, Arizona, and on the Santa Rita Experimental Range which is located about 35 miles south of Tucson. Specimens have also been received from Dugas, Prescott, the Huachuca Mountains, Showlow, Greaterville and Linden, Arizona. In 1933, a specimen of *T. protracta* deposited ten eggs loosely in a glass jar in the laboratory during the latter part of March. This Triatoma deposited one more egg and died before April 15. The eggs are uniformly white and ellipsoidal in shape with a cap-like portion at one end. This cap is covered with numerous projections which make it appear rough. The surface of the egg shell is pitted with numerous tiny depressions which give it a granular appearance. Nine eggs were measured; the length ranged from 1.97 mm. to 2.10 mm. while the diameter ranged from 0.96 mm. to 1.15 mm. Normally they are of uniform diameter and not flattened.

Triatoma uhleri is dark brown in color and the sides of the prothorax, abdomen and the costal margin of the wings at the base are marked with yellowish red. (See figure). It is about 17–22 mm. long, being somewhat larger than *T. protracta.* It occurs in the vicinity of Tucson, where it is the most common species of the genus. Specimens have been collected or received from the foothills of the Tucson Mountains, Santa Catalina Mountains, and the Tortillita Mountains, and from the Santa Rita Experimental Range. Specimens have been received from Octave, Cleator, Continental, Safford, Florence, Kingman, Cortaro, San Miguel near Sells, and

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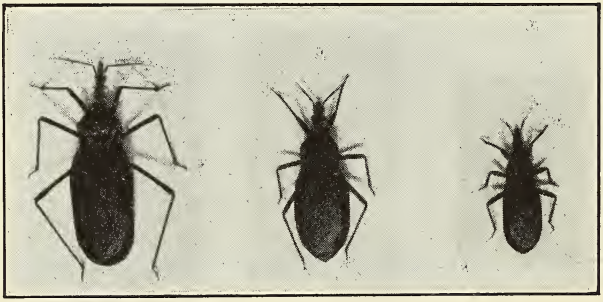
[1] In this paper, measurements of adult insects were made from the anterior margin of the head to the posterior margin of the abdomen. Determinations of all three species which were made by the writer are based upon specimens identified by H. G. Barber.

Miami, Arizona, and from Naco and Imuris, Sonora, Mexico. It also occurs in Tucson and in the vicinity of Cochise, Arizona, and at Bard, California. Eggs of *T. uhleri* were laid loosely in glass jars in the laboratory in late June and early July in 1933. One egg which was laid between June 21 and June 23, 1933, hatched between June 30 or July 1 and the morning of July 5. The eggs are delicate pink and translucent. They are oval in shape and at one end there is a prominent collar or ring. There are no tubercles, pits or projections of any kind. The entire egg shell is reticulated both over the general surface and within the ring. The reticulations have five or six sides. They are so fine that the eggs appear to be smooth. After incubation, two pink eye-like spots of the embryo show at about one-third of the length of the egg at the collar end. The micropyle appears to be at the center of the area within the ring. Fifteen eggs were measured; the length ranged from 1.63 mm. to 1.83 mm. while the diameter ranged from 1.00 mm. to 1.02 mm. They are normally of uniform diameter and not flattened.

Triatoma longipes Barber is black in color and large in size, being about 28 mm. long. (See figure.) This species occurs in the Tucson area. Specimens have been received from the foothills of the Tucson Mountains, the foothills of the Santa Catalina Mountains, the Santa Rita Mountains, and Bisbee, Arizona. Specimens which were collected by Mrs. M. H. Koogler in the foothills of the Tucson Mountains were sent by the writer to Mr. H. G. Barber in 1932. Mr. Barber described the species in 1937. (Proc. Ent. Soc. Wash., Vol. 39, No. 4, pp. 86–87. 1937.)



T. longipes *T. uhleri* *T. protracta*
Photo by C. T. Vorhies.

HABITS.

The evidence seems to indicate that triatomas are usually found in the dens of wood rats (*Neotoma albigula albigula*). Less frequently these insects occur in other shelters such as are found in or near piles of wood or under houses or adjacent to poultry houses. Under these conditions there is unquestionably some source of blood near by like that of rodents, birds including poultry, or man. From the beginning of these observations, the writer suspected that rodents were associated with triatomas. This suspicion was confirmed by the following incidents.

On December 31, 1930, Mr. C. R. Reynard collected five specimens of *T. protracta* in tunnels of the wood rat on the Santa Rita Experimental Range. This Range is located about thirty-five miles south of Tucson, Arizona.

In a letter dated March 26, 1932, Mr. H. G. Barber stated to me that he found *T. protracta* very common in the nests of wood rats in California.

Beginning in June, 1932, an attempt was made to capture the triatomas as they escaped from the nest of the wood rat. A metal and screen fly trap was placed over an opening to a nest. Side openings in the base of the trap were closed with corks and soil was placed around the lower part of the trap. No triatomas were captured in this way. The triatomas may have escaped previously or they may have come out by other openings in the nest or they may have remained in the nest. It is also possible that there were no triatomas in the nest. This experiment was tried on two nests in the immediate vicinity of a house in which the people were being annoyed seriously by triatomas.

In November, 1932, Dr. C. T. Vorhies and Dr. W. P. Taylor were excavating wood rat dens in connection with a study of the wood rat. In these and subsequent studies of the wood rat, they have very kindly turned over any triatoma specimens and observations to the writer. On November 14, 1932, they excavated two dens on the Santa Rita Experimental Range. In one den they found four adult specimens of *T. protracta* in the neighborhood of the grass sleeping nest. The second den which they excavated was abandoned and in this den they found no triatomas. On November 15, in a third den, they found three *T. uhleri* nymphs, two of which were in the neighborhood of the nest. A fourth den on the same day was found to be full of debris and no triatomas were observed. It is possible that there may have been triatomas in the debris.

The specimens were brought to the laboratory and referred to the writer. Upon examination, it was found that the abdomens of two of the nymphs were distended. The abdomen of the specimen which was distended most was opened and yielded red blood. Microscopic examination showed that the triatoma had digested the blood to quite an extent, although it showed some circular and elliptical bodies and the liquid was red. This observation was checked by Dr. C. T. Vorhies, who said that mammalian corpuscle remains were present.

In a letter dated November 16, 1932, Mrs. James B. Reidy informed me that on November 13 she found an assassin bug in the den of a pack rat. The writer believes the assassin bug in question was undoubtedly a species of *Triatoma.* This seems to have been in the vicinity of Oracle Junction which is about 22 miles north of Tucson.

On November 28, 1932, Vorhies and Taylor collected a *Triatoma* nymph from a den of the wood rat on the Santa Rita Experimental Range.

On December 6, 1932, Vorhies and Taylor examined two dens of the wood rat on the Santa Rita Experimental Range and found the following: In one den they saw a *Triatoma* which escaped. In the second den they found six *Triatoma* nymphs. Four of these were large and two were small. Two of the large nymphs were evidently engorged with blood since their abdomens were much distended. The large nymphs were *T. uhleri.*

On December 7, 1932, Vorhies and Taylor examined another den of the wood rat and found three triatomas. Two of these were adults of *T. protracta.* The third specimen was a large nymph of *T. uhleri.* It was evidently engorged with blood as the abdomen was greatly distended. These three specimens were taken off the top of the nest of the wood rat. Material from this den was brought into the laboratory and on December 13, Miss Proctor, a laboratory assistant, found a small *Triatoma* nymph among the material.

On December 21, 1932, Vorhies and Taylor made a careful excavation of a wood rat den without greatly disturbing the nest. They found nine *Triatoma* nymphs on top of this nest. Eight of these were large nymphs and one was small. Six of the nymphs were evidently engorged with blood.

On March 14, 1933, Vorhies and Taylor excavated dens of wood rats southeast of Tucson. They found adults and nymphs of *T. protracta* and one nymph of *T. uhleri.*

On May 22, 1933, Vorhies, Taylor, and the writer opened dens of the wood rat a few miles east of Tucson, Arizona. Six triatomas were found in one den. Of these, two were adults of *T. protracta* and three were nymphs of *T. uhleri.* There was a fourth

Triatoma nymph which was smaller. Seven other *Triatoma* specimens were taken from other dens. Of these, three were adult of *T. uhleri,* two were nymphs of *T. uhleri* and there were two smaller *Triatoma* nymphs.

On July 20, 1933, Vorhies, Taylor, and the writer dug out a few dens of wood rats in the Tucson Mountains, west of Tucson. Only one *Triatoma* nymph, somewhat engorged, was collected.

On July 25, 1933, Vorhies and Taylor collected a nymph of *T. uhleri* from the den of a wood rat on the Santa Rita Experimental Range.

On September 21, 1933, Vorhies and Taylor collected seven *Triatoma* nymphs from a den of the wood rat on the Santa Rita Experimental Range. Six of these nymphs were *T. uhleri.*

On November 9, 1933, Taylor collected two adults and four nymphs of *T. protracta* from the dens of wood rats on the Santa Rita Experimental Range.

Vorhies collected three nymphs of *T. uhleri* from a den of the wood rat about twenty-five miles southwest of Sells, Arizona.

In April, 1937, Dr. R. H. Forbes found nymphs of *T. uhleri* in a shed at the rear of his home in Tucson, Arizona. The nymphs were in a box, filled with paper, near his poultry roosts.

In August, 1937, Mr. Steven Gollob collected six nymphs of *T. uhleri* from a cupboard which stood adjacent to chicken quarters. The bodies of five of these nymphs were distended and were evidently engorged with blood.

SEASONAL HISTORY.

From these records, it is evident that triatomas are present throughout the year either in the dens of wood rats or in some other shelter where a source of blood is available. They feed on blood at intervals.

Early in May winged adults, both males and females, begin to invade houses which are in the vicinity of wood rat dens in the open country or desert. They seem to be attracted to the houses by light. They may appear in houses in cities although this is not common owing to the absence of favorable hosts in the vicinity. They continue to invade country houses during the summer, but are most numerous during May and June. There is a definite flight at this time which the writer believes to be a dispersal flight.

During May and June, the triatomas cause the greatest inconvenience to people because of their blood sucking habits. They remain hidden during the day but may be seen in the evening on beams of ceilings, walls, around windows, curtains and similar places in lighted rooms. They may even hide in beds, between quilts and under rugs. They are alert and hard to catch, running and trying to hide in dark places if pursued. At such times, they do not take flight but run rapidly for cover. They do not attack their victims until the people are quiet or asleep. The triatomas have reached such a high degree of parasitism that they are able to take blood without awakening the sleeping host. Immediately after the blood has been taken, the person is awakened by severe itching. The area around the puncture swells, becomes red and feverish and itches. These welts are hard and vary in size from one-half inch to three inches in diameter. There are also other reactions. These conclusions are based mainly upon observations of *T. uhleri.* There is evidence to show that *T. protracta* and *T. longipes* have the same habits.

Numerous cases of *Triatoma* invasion have come to the attention of the writer and the people have given him the details of their experiences. The following are among the most interesting of the cases:

Mr. and Mrs. "A" were proving up on a homestead in the foothills of the Tucson Mountains. They were greatly annoyed by the triatomas, particularly the adults and nymphs of *T. uhleri* and the adults of *T. longipes.* At one time, they were obliged to ask permission from the government so that they could leave their homestead while the bugs were most active. Both Mr. and Mrs. "A" were bitten at night while in bed and as usual were not awakened until after the blood was taken. They were then aroused by itching. It seemed to Mrs. "A" that the triatomas make several punctures until they find a blood vessel and then suck blood. Large swollen welts similar to hives appear along the blood vessel. The pain and swelling is most severe on the second and third days and gets better on the fourth day. After the swelling goes away, a little watery blister is left. At one time, Mrs. "A" had eighteen punctures from her shoulder to her left wrist. A hive-like condition appeared which moved down over the arms to both hands but was worst on the left arm which was punctured. There was an aching condition in the elbows and wrists like rheumatism. The hands and arms swelled from the shoulders down slowly over a period of two to three weeks. Her condition grew worse until she fainted while working in the kitchen. A physician was treating her for indigestion. Mr. and Mrs. "A" did not suspect that bug bites were causing her trouble until Mr. "A" was punctured on the throat. He broke out with a rash like measles on his shoulders, back and chest, down to the waist.

At another time when Mrs. "A" was bitten, she had a reaction as though she had stepped under a shower or had a chill. She was bitten on the back near the shoulder, and goose pimples appeared on her arms within half an hour. The bite was similar to an ant bite, the welt being about the size of the end of the thumb. According to Mrs. "A," after one has been bitten a number of times, a dopey effect develops, and one feels depressed and has a high temperature.

The second case was that of the family of Mr. and Mrs. "B" who lived in a lovely home near the edge of Tucson, Arizona, in a newly developed district. In 1931, Mrs. "B" was bitten at night three times. As is usual, she was not awakened by the bite, and she did not realize that she had been bitten by bugs. Red welts were formed, her whole leg swelled and her whole arm swelled. Her heart action was speeded up perceptibly. About a week later, a rash broke out over her body. This was followed by a low grade rheumatic fever of 99 degrees. A physician diagnosed the condition as streptococcus poisoning, but when the welts appeared again in 1932, Mrs. "B" became suspicious of bugs. The bites in 1932 were not as painful as in 1931 but itched greatly. The welts were hot, red, and sore, and about two inches in diameter. The secondary reaction was a very tired feeling. She felt sleepy all the time and slept a good deal. Mr. "B" was bitten and developed the hot itching welts, but had no after effects. The species concerned here was *T. uhleri.*

Vorhies, Taylor and the writer dug up and examined wood rat dens on the premises of this place during the winter of 1932–1933. Both wood rats and triatomas were collected. The wood rats were able to get under the house and had run-ways close to the house as well as numerous dens on the premises. Vorhies and Taylor set traps at various places close to the house as well as at the openings of many dens in the vicinity of the house for a distance of perhaps a hundred yards. They were very successful in catching wood rats with the traps. In July 1933 Mr. "B" said that Mrs. "B" had not been bitten by a *Triatoma* and had not been ill in 1933.

The third case is that of a family who had an attractive home on the open desert. The daughter, whom we shall designate as Miss "C" was bitten at night by *T. uhleri.* As usual she was not awakened until after the bug had fed. She was aroused by itching and the *Triatoma* was found in the bed. She was bitten on the lower part of the abdomen and had a violent and instant reaction. First she had a stomach ache, and then a rash appeared over the entire body. This was followed by nausea and vomiting and all these symptoms developed within ten or fifteen minutes after being bitten. The girl was so sick that she could hardly walk and had such a pain in her abdomen that they feared she had appendicitis. She was better in three quarters of an hour. The bites formed red, feverish, gradual flat cones about half an inch high and two inches in diameter. Miss "C" 's brother was bitten and had no violent reaction, but did not feel well for a few days afterward.

The fourth case is that of the family of Mr. and Mrs. "D," living in the foothills of the Tucson Mountains. This family came to see the writer in 1933 and reported that they had been troubled by the triatomas for four summers. The species concerned was *T. uhleri.* Mr. and Mrs. "D" had three boys, six, four and a half, and one and a half years old. In 1932 all three children were sick at the time when they were being bitten. The oldest boy had been in bed for a week and had been troubled with nausea and vomiting. The other two children were sick at the same time. The oldest boy and the baby showed rash. In 1933 the baby was not well. He whined, was restless, and wakeful at night and had no appetite. When the writer saw this child in the late afternoon, he had a recent bite on the back of his left hand and one on the outside of the wrist of the left hand and an old bite on the buttock. There was a rash near the old bite which was very pronounced in the morning and was still visible in the late afternoon. The new bites were red, swollen and hot. Neither Mr. nor Mrs. "D" had realized that there was any connection between the children's illness and the bites of the bugs. They had attributed the illness to the heat of summer. Had it been due to the heat, the rash would have been more pronounced in the afternoon than it was in the morning. As it was, the rash showed more plainly in the morning.

The writer advised Mr. and Mrs. "D" to cover their beds with mosquito netting to keep out the bugs. They did this in the case of the baby and reported within a week that the baby felt much better. He had had no more *Triatoma* bites.

The fifth case was that of Mr. and Mrs. "E" who lived on the desert in the Tortillita Mountain region. They were bitten at night without being awakened, as is usual. They were able to catch the bugs in the act of biting by staying awake and using a flash light. Both Mr. and Mrs. "E" had the red, hot swollen welts, but Mrs. "E" did not have any secondary effects. Mr. "E" had sick headaches and felt enervated and run down as though he was going to be sick. He was bitten often during the middle of May and June in 1932, and did not feel well at this time. After the first of July, the bugs gave them no more trouble and Mr. "E" had no more sick headaches and enervated feeling.

A sixth case with which the writer was familiar has been fully described by Dr. C. A. Kofoid (3).

Other cases have come to the attention of the writer, but it does not seem necessary to recount them.

METHODS OF PREVENTION AND CONTROL.

Since *T. uhleri* and *T. protracta* normally live in the dens of wood rats, these rodents should be eliminated from the vicinity of dwellings for a distance of at least one hundred yards. A forthcoming bulletin of the Arizona Agricultural Experiment Station by Vorhies and Taylor will deal fully with the life history and ecology of the wood rat. The presence of wood rats or other animals under the house should not be permitted. Poultry houses and adjacent shelter should be searched at intervals for triatomas.

Houses should be tightly screened to exclude the insects. Although triatomas are not definitely known to enter houses by way of chimneys, it may be desirable to place screens in front of fire places if the insects are suspected of gaining entrance in this manner. If a member of the household has been bitten, the bed clothes and rooms should be thoroughly searched until the insect has been located and destroyed. Sometimes the bugs may be seen on walls, curtains, or beams of ceilings in the evening when the room is lighted, at which time they may be collected and destroyed.

If it is not possible to exclude the triatomas from the house by the preceding methods, sleeping persons may be protected by the use of mosquito netting. This method has proved to be very effective but care must be taken to make certain that no triatomas are hiding in the bed clothing. The mosquito netting must be carefully tucked in around the edges so that the triatomas are not able to reach the sleeping person. The young wingless nymphs may be prevented from attacking sleeping persons by placing the legs of beds in cans in which a small amount of kerosene has been placed.

Ammonia is said to be very beneficial if applied to the puncture within half an hour after the person has been bitten. Bathing the punctures in hot water and Epsom salts would probably give relief.

The relation of triatomas to human disease has been studied by Dr. Charles A. Kofoid and his associates at the University of California at Berkeley. In 1916 Kofoid and McCulloch (1) described a species of trypanosome in the digestive tract of *T. protracta.* This trypanosome proved to be *Trypanosoma cruzi,* the causative organism of a South American disease, known as Chagas disease. In 1933, Kofoid and Donat (2) found *Trypanosoma cruzi* in *T. protracta* in San Diego County, California. In 1936 Kofoid and Whitaker (3) found *Trypanosoma cruzi* in *T. uhleri* from Tucson, Arizona. Vorhies and the writer have cooperated with Kofoid in this work by sending specimens. The infected specimens came from the foothills of the Santa Catalina Mountains and from a locality a short distance south of Tucson. In 1938, Sherwin Wood (4) found infected specimens of *T. protracta* in Los Angeles County, California. Further work by Wood and Wood (5) shows that the infection of triatomas does not seem to be widespread in the Southwest.

SUMMARY.

1. At least three species of *Triatoma* occur in the Tucson area, *T. protracta, T. uhleri* and *T. longipes. T. uhleri* is the most common.

2. *T. protracta* and *T. uhleri* are present throughout the year either in the dens of wood rats or in some other shelter where a source of blood is available. The habitat of *T. longipes* is not known.

3. There is apparently a dispersal flight during May and June when *T. uhleri* and *T. longipes* invade houses.

4. The nymphs and adults of *T. uhleri* and the adults of *T. longipes* and *T. protracta* puncture sleeping persons and suck blood.

5. The most effective means of control for *T. uhleri* and *T. protracta* is to eliminate the wood rats in the vicinity.

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LIST OF COLEOPTERA FOUND LIVING IN AND ON VARIOUS FUNGI.

By Herman Moennich, Little Neck, N. Y.

This is a list of Coleoptera taken from various species of fungi. Some of this list were taken from the fungi in the field and some of the specimens of fungi were taken home, put in jars and these jars set in the garden to see what species could be baited in the decomposing fungi. All species of fungi were named by Mr. F. R. Lewis, of the New York Mycological Society.

Lactarius piperatus Fries.

The following list of Coleoptera were taken from the fungus in the field.

Staphylinidae.

Oxytelus nanus Er., 2 specimens; 8.2.1937, Tenafly, N. J.
Gyrophaena fasciata Say, 6 specimens; 8.2.1937, Tenafly, N. J.

Dermestidae.

Stelidota geminata Say, 1 specimen; 7.31.1938, Midvale, N. J.

Erotylidae.

Tritoma angulata Say, 3 specimens; 8.21.1938, Suffern, N. J.
Tritoma biguttata Say, 1 specimen; 7.31.1938, Midvale, N. J.

Scarabaeidae.

Geotrupes balyi Jek., 1 specimen; 7.31.1938, Midvale, N. J.

The following is a list of the Coleoptera baited in the jars on *Lactarius piperatus* Fries.

Staphylinidae.

Oxytelus nanus Er., 2 specimens; 8.22. to 29.1938, Little Neck, N. Y.
Stilicus dentatus Say, 3 specimens; 8.22 to 29.1938, Little Neck, N. Y.
Actobius nanus Horn, 1 specimen; 8.22 to 29.1938, Little Neck, N. Y.
Philonthus longicornis Steph., 3 specimens; 8.22 to 29.1938, Little Neck, N. Y.
Philonthus cruentatus Gmel., 1 specimen; 8.22 to 29.1938, Little Neck, N. Y.

Belonuchus formosus Grav., 2 specimens; 8.22 to 29.1938, Little Neck, N. Y.

Atheta virginica Bnhr., 5 specimens; 8.22 to 29.1938, Little Neck, N. Y.

NITIDULIDAE.

Omosita colon L., 1 specimen; 8.22 to 29.1938, Little Neck, N. Y.

Epuraea helvola Er., 1 specimen; 8.22 to 29.1938, Little Neck, N. Y.

Glischrochilus fasciatus Oliv., 2 specimens; 8.22 to 29.1938, Little Neck, N. Y.

MYCETOPHAGIDAE.

Litargus tetraspilotus Lec., 2 specimens; 8.22 to 29.1938, Little Neck, N. Y.

Litargus nebulosus Lec., 5 specimens; 8.22 to 29.1938, Little Neck, N. Y.

HISTERIDAE.

Hister memnonius Say, 1 specimen; 8.22 to 29.1938, Little Neck, N. Y.

Saprinus posthumus Mars., 1 specimen; 8.22 to 29.1938, Little Neck, N. Y.

Lactarius volemus Fries.

These species were taken from fungus in the field.

STAPHYLINIDAE.

Gyrophaena fasciata Say, 4 specimens; 8.15.1937, Tenafly, N. J.

Boletobius pygmaeus Fab., 1 specimen; 8.15.1937, Tenafly, N. J.

NITIDULIDAE.

Pallodes silaceus Er., 1 specimen; 8.15.1937, Tenafly, N. J.

EROTYLIDAE.

Tritoma angulata Say, 5 specimens; 8.15.1937, Tenafly, N. J.

Baited on *Lactarius volemus* Fries.

MYCETOPHAGIDAE.

Litargus tetraspilotus Lec., 2 specimens; 8.22 to 25.1938, Little Neck, N. Y.

Litargus nebulosus Lec., 5 specimens; 8.22 to 25.1938, Little Neck, N. Y.

NITIDULIDAE.

Pallodes silaceus Er., 1 specimen; 8.22 to 25.1938, Little Neck, N. Y.

All of this list were taken in the field.

Collybia platyphylla Persoon.

STAPHYLINIDAE.

Gyrophaena fasciata Say, 12 specimens; 7.31.1938, Midvale, N. J.

NITIDULIDAE.

Pallodes silaceus Er., 10 specimens; 7.31.1938, Midvale, N. J.

Boletus granulatus Linnaeus.

STAPHYLINIDAE.

Hesperus apicalis Say, 2 specimens; 7.31.1938, Midvale, N. J.
Tachinus fimbriatus Grav., 1 specimen; 7.31.1938, Midvale, N. J.

HISTERIDAE.

Saprinus patruelis Lec., 1 specimen; 7.31.1938, Midvale, N. J.

Clavaria aurea Schaeffer.

STAPHYLINIDAE.

Hesperus apicalis Say, 1 specimen; 7.31.1938, Midvale, N. J.
Staphylinus viridanus Horn, 1 specimen; 7.31.1938, Midvale, N. J.

HISTERIDAE.

Hesperus apicalis Say, 2 specimens; 7.31.1938, Midvale, N. J.

SCARABAEIDAE.

Geotrupes splendidens Fab., 1 specimen; 7.31.1938, Midvale, N. J.

Amanita solitaria.

EROTYLIDAE.

Tritoma biguttata Say, 1 specimen; 7.31.1938, Midvale, N. J.

Notice to Authors:—Until further notice, we will not be able to accept papers on other than United States insects.—Editor.

REMARKS ON THE GEOGRAPHICAL DISTRIBUTION OF NORTH AMERICAN COLLEMBOLA.

By Harlow B. Mills, Montana Experiment Station.

In the study of the geographical distribution of insects, the Collembola represent an excellent group for examination. They are primitive in habitat, primitive in organization, and moderately abundant in numbers.

It is doubtful if any other group of animals has so large a percentage of species which are either Holarctic or Cosmopolitan in their distribution. In 1901 Dr. J. W. Folsom (Psyche, IX, pp. 159–162) made the first observations on North American Collembola with reference to geographical distribution, and at that time stated: "Twenty-five per cent of the Nearctic species, then, are also Palaearctic. . . . This proportion is increasing with the comparison of additional specimens." At the present time thirty-one per cent of our American species are known to be either Holarctic or Cosmopolitan in their distribution, despite the description of many new indigenous forms.

The relationship of North American forms to those of other continents is primarily with the European fauna. However, a few species are common to North America and Asia. This does not mean that in the final analysis European forms will necessarily bear the same proportionate relationship to Nearctic species as that which pertains now. From the time of Linnaeus the collembolan fauna of Europe has received attention, and is consequently much better known than is that of northeastern Asia, where but few collections have been made.

Excluding obvious synonyms and forms which cannot now be placed, two-hundred-eighty-five species of Collembola are known from North America at the present time. Of these, sixty-eight per cent are indigenous, thirty-one per cent Holarctic or Cosmopolitan, and approximately one per cent common to both this continent and Siberia.

Distribution of Known North American Collembolous Species.

	Poduridae	Entomobryidae	Sminthuridae	Total
Indigenous	61%	69%	75%	68%
Holarctic or Cosmopolitan	35	30	25	31
Asiatic	4	1	0	1

While some of the species which are common to two or more faunal regions probably were distributed by commerce, many were without doubt common to these areas before man could have been a factor in distribution. Primitive forms, which are as a rule most widely spread, have many species which have a semi-continuous distribution from North America, through northeastern Canada and Greenland to Northwestern and Central Europe. *Achorutes viaticus, A. armatus, A. tullbergi, A.* (*Schöttella*) *uniunguiculata, Xenylla humicola, Anurida granaria, Neanura muscorum, Onychiurus armatus, O. groenlandicus, Tetracanthella wahlgreni, Isotoma viridis, I. olivacea, I. violacea, Pseudisotoma sensibilis, Archisotoma besselsi, Folsomia fimetaria, F. quadrioculata, F. diplophthalma,* and *Lepidocyrtus cyaneus* all extend from North America through Greenland to Europe, and several of them are circumpolar or Cosmopolitan. Further collection in the north will doubtless increase the list. I have recently examined specimens of *Isotoma bipunctata* and *Deuterosminthurus insignis* collected at Churchill, Manitoba, during the summer of 1936 by H. E. McClure. These species have never before been recorded from North America, but both have long been known in northern Europe.

Neanura gigantea, Onychiurus dentatus, Isotoma viridis and *I. violacea mucronata* have been reported from the Pribilof Islands between Alaska and Siberia.

The greatest percentage of exotic species, according to present records, occurs in the Boreal region of North America as the following table demonstrates:

Location	Indigenous	Holarctic or Cosmopolitan	Asiatic
Boreal (Alaska and North Canada)	29%	64%	7%
Temperate (Iowa)	56	48	1
Tropical (Costa Rica)	75	25	0

In the face of the facts that many species are found in central and northern Europe, the northern Atlantic islands, and the North American continent on the one hand, others in Siberia, the Pribilof Islands, and the North American continent, on the other, and that the proportion of exotic species is greatest in the north where dissemination could most easily take place today (and doubtless much easier during earlier geologic ages), it is logical to believe that much intercontinental dissemination of species occurred naturally in the north.

At the present time, intercontinental commerce is important in the dissemination of Collembola. Their small size and secretive habits doubtless allow many to enter the United States, despite the fact that literally thousands of individuals and scores of species are intercepted annually at ports of entry. The European *Entomobrya nivalis* appeared almost simultaneously in 1934 on both the Atlantic and the Pacific Coasts. Collembola have been collected on the Atlantic seaboard since the time of Fitch, and surely this species would have appeared in collections previous to 1934 had it been present. Further, it has been intercepted several times at ports of entry. Other European species, such as *Entomobrya corticola, Orchesella cincta, Sira buski,* and *Sira platani* are apparently restricted to the eastern part of the United States and Canada, and doubtless were introduced from Europe. Indeed, it is surprising that more have not appeared. The "luzerne flea" *Sminthurus viridis,* which is common in Europe and Great Britain, has found its way to Australia where it damages alfalfa, but as yet it has not appeared in more accessible North America.

Collembola are commonly called "snow fleas," but it is interesting to note that they reach their greatest diversity and specialization in the tropics where snow never falls. Primitive forms become less abundant as one travels south, and at the same time the more specialized species increase, as the following table, based on species which can be identified at the present time, will show:

Location	Poduridae (Primitive)	Entomobryidae (Intermediate)	Sminthuridae (Specialized)
Boreal (Alaska and Northern Canada)	42%	44%	14%
Temperate (Iowa)	36	43	21
Tropical (Costa Rica)	30	51	19

The fact that these insects are so definitely dependent on saturated atmospheres for their existence does not seem compatible with their wide distribution. As Folsom (*loc. cit.*) has said, "They lack wings and probably always did, as none are found in the embryo; their feeble walking and leaping could produce only a limited local distribution; a dry spot is an effective barrier to most

Collembola. . . ." There are several ways, however, in which they may be transported, sometimes over great distances. Soil, which is kept moist about the roots of plants will form ideal situations for them. I have taken many species from wet moss used as packing and shipped over one thousand miles, and *Entomobrya assuta* from boxes of peaches.

Water currents doubtless assist in their dispersal. During the spring, when the streams are high, certain species sometimes appear in masses and may be carried considerable distances either directly on the surface or on floating debris. On January 1, 1889, Mr. C. A. Hart examined drifting material in a creek at Urbana, Illinois, and collected the following species: *Achorutes armatus, Isotoma viridis, Isotomurus palustris, Entomobrya assuta, E. purpurascens, Orchesella ainsliei,* and *Ptenothrix marmoratus.*

Winds may assist in local dissemination of various species. In Dr. Folsom's unpublished notes I find the following record: Near Homer, Illinois, a rain formed a temporary pool on top of a bluff. Shortly afterward, a strong wind started blowing across a stream four-hundred feet away in the valley and over the pool. The aquatic *Sminthurides aquaticus,* and the semi-aquatic *Isotomurus palustris,* which were found along the creek, were soon collected from the surface of the pool. It is doubtful, though, if a Collembolan could stand the desiccation to which it would be subjected on a long stratosphere flight and alight alive.

There are always possibilities of accidental dissemination by animals, but these certainly would be the exceptions. Collembola are often found in rodent burrows, and have been taken from the fur of small animals. They have been found in bird's nests and might be carried in their feathers. While working on a manuscript on Collembola one night a noctuid moth flew in the fourth story window and struck my paper—leaving behind an unharmed specimen of *Deuterosminthurus repandus.*

RECORDS AND NOTES OF NEARCTIC MECOPTERA AND RAPHIDIODEA.

By F. M. Carpenter, Harvard University, Cambridge, Mass.

Some of the scorpion-flies and snake-flies which have passed through my hands during the past year are of unusual interest, either because of their locality data or of the rarity of the species represented. These records have been brought together in this paper. Included also are some notes, which I made during the past summer, on the types of Nearctic Mecoptera contained in certain European Museums. I am indebted to the individuals mentioned below for sending me material for examination.

Order MECOPTERA.

Family Panorpidae.

Brachypanorpa oregonensis (MacLachlan)

Several specimens of this uncommon insect, contained in the National Museum collection, were kindly sent to me by Mr. A. B. Gurney. One of these, a male collected at Neola, Utah (July 13, 1935, F. C. Harmston), is of particular interest, since it is the first record of the species (or of the genus) in that state. This extends greatly the range of the insect, which has previously been found only in Oregon and Idaho. A study of these new specimens and of an additional series from Oregon sent by Mr. Gurney has convinced me that *oregonensis* is the only valid species of the genus at present known from the western states, *B. montana* Carp. (Bull. Mus. Comp. Zool., 72, 1931, p. 212) being a synonym. The specimens now at hand show an intergradation of the characteristics which I had previously supposed distinguished the two species. Unfortunately in *Brachypanorpa,* as in *Panorpodes,* the male genitalia show almost no specific differences; the male of *carolinensis* Banks, from North Carolina, is nearly identical with that of *oregonensis,* though the females are decidedly different. *B. montana* was based upon a series of males which appeared to possess distinctive coloration, but it now seems clear that the species is highly variable in this respect.

Panorpa venosa Westwood

I have recently examined the types of this species in the British Museum. There are two of these, both females, from Georgia. One is obviously identical with the species which I considered to be *venosa* in my revision of the Nearctic Mecoptera (Bull. Mus. Comp.

Zool., 72, 1931, p. 234). The other, which lacks the tip of the abdomen, is not the same species; it is undoubtedly *isolata* Carp. (1931), which is very common in Georgia. To avoid confusion and changes of names, the former specimen is hereby designated the lectotype of *venosa.*

Ten specimens of *venosa* were collected at Knoxville, Tenn., May 22 and June 5, 1936 (D. A. Johnson), these constituting the first record for that state.

Panorpa americana Swederus

One specimen of this species was collected at N. Augusta, Miss. (Oct. 3, 1931, H. Dietrich); it is the first record of *americana* in that state. Four specimens were also taken at Yonah Mt., Georgia (June 10–20, 1937, P. W. Fattig), these being the only specimens recorded from Georgia in addition to the types, which were collected more than forty years ago.

Panorpa refuscens Rambur

In my revision of the Nearctic Mecoptera (p. 237) I remarked that the type of *rufescens* was contained in the Royal Museum of Natural History at Brussels. This assertion was based upon a statement (*in litt.*) by Dr. A. Ball, who had kindly sent me notes and drawings of the specimen. During a recent visit to the Brussels Museum, I examined this specimen but failed to find any evidence of its being the type of *rufescens.* It was not marked "type" and had no label in Rambur's writing, but did possess determination labels of Navas and Esben-Petersen. After I discussed the matter with Dr. Ball, he agreed that it was not the type of *rufescens,* as he had previously supposed. This opens again the question of the identity of *rufescens,* the type apparently being lost.[1] It seems advisable, under the circumstances, to recognize *rufescens* as it has been treated in the past by Banks and myself.

In this connection mention should also be made of the type of *Panorpa debilis* Westwood, which has been regarded as a synonym of *rufescens* (*confusa* Westwood). In the British Museum there is a female *Panorpa* labeled *debilis* which bears a type label; this is the same species as *canadensis* Banks, not *rufescens.* But since

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[1] In Horn and Kahle's "Uber entomologisch Sammlungen," the disposition of the Neuroptera in Rambur's collection is given as follows: "Neuropt. u. Odonat. via M.E. de Selys-Longchamps au Mus. Roy. Hist. Nat. Belg., Brussels." The supposed type mentioned above was one of Latreille's specimens, which were also included in the de Selys-Longchamp material.

Westwood's description of *debilis* mentions only *two males,* this specimen cannot be a type. As in the case of *rufescens,* it seems advisable to continue to regard this species as it has been treated in the past.

Panorpa robusta Carp.

Two males of this rare species were collected by P. W. Fattig at Dacula, Georgia, May 23, 1937. These are the only specimens known to me in addition to the unique type, which was taken at Meredith, South Carolina.

Panorpa neglecta Carp.

Two specimens of this insect, previously known only by the male (type locality, Auburn, Alabama), were collected by P. W. Fattig in Georgia, a male at Blairsville, Aug. 31, 1929, and a female at Dallas, Sept. 26, 1937. Since the female of *neglecta* has not previously been known, the above-mentioned specimen is here designated as the allotype. The wing markings are like those of the male type, and the female of this species will run to couplet 20 of my key to the females of *Panorpa* (1931, p. 226). From the two species (*venosa* and *virginica*) included there, *neglecta* can be distinguished by the structure of the internal skeleton of the ninth abdominal segment (figure 1A). This is rather broad, with the axis projecting beyond the plate, the two elements of the projecting axis being widely divergent. There is a small envelope surrounding the anterior part of the plate, with a dark spot at each side.

Panorpa flexa Carp.

Five additional specimens of this uncommon species have been recently sent to me for determination. Four of these (1 ♂, 3 ♀♀) were collected at Yonah Mt., Georgia, June 10 and 20 (P. W. Fattig). These are the first records from Georgia, the species having been found previously only in North and South Carolina. The fifth specimen is a male collected at N. Park, Smoky Mts., N. Carolina, Aug. 5, 1934 (Bradley and Knorr).

Panorpa submaculosa Carp.

The first Wisconsin record of *submaculosa* is a male, from Merril, on the Wisconsin River, July 1–2, 1933 (Ross and Mohr).

Panorpa nebulosa Westw.

Eight specimens of this insect were collected at Knoxville, Tenn. (June 5, 1936, D. A. Johnson), constituting the first records of the species in that state.

Family BITTACIDAE.

Bittacus occidentis Walker

One specimen was collected at Norris, Tenn. (June 21, 1937, G. B. Huffaker); it is the first record in the state.

Bittacus strigosus Hagen

One specimen taken at Knoxville (June 8, 1936, G. B. Huffaker) constitutes the first Tennessee record.

Family BOREIDAE.

Boreus brumalis Fitch

A female, collected in the Smoky Mts., Tenn. (January 30, 1938, 4000 ft. elevation, A. C. Cole) seems to belong without question to *brumalis.* This is by far the most southern record of this insect, and of the genus in the eastern states. The wing pads of this specimen are lighter in color than they are in other specimens which I have seen, but there seem to be no structural differences between this insect and more typical members of the species.

Boreus nivoriundus Fitch

A male of this species was collected at the same locality as the foregoing insect (A. C. Cole), and it is also the first record of the species in Tennessee. The specimen is a typical *nivoriundus* in all respects, except that the body is somewhat darker. The margin of the hypandrium is entire, as in *nivoriundus.* When I first examined the two specimens of *Boreus* recorded here, I assumed they represented a single, undescribed species; but since there are no morphological differences to distinguish them from *brumalis* and *nivoriundus,* respectively, and since the two latter insects frequently occur together, I have concluded they are only atypically colored specimens of those species.

Order RAPHIDIODEA.

Family RAPHIDIIDAE.

My attention has recently been called to the omission of the last couplet of the key to the males of *Agulla* (pp. 114–115) contained in my revision of the Nearctic Raphidiodea (Proc. Amer. Acad. Arts Sci., 71: 89–157). This couplet, which would have been numbered 18, was intended to distinguish the two species of subgenus *Alena,* as follows:

Pterostigma more than 3 times as long as wide; dorsal process of harpogones extending beyond epiproct .... *minuta* Banks.
Pterostigma at most twice as long as wide; dorsal process of harpogones much shorter than epiproct .... *distincta* Banks.

Agulla flexa Carp.

One male of this rare species was secured at Thorndike, Panamint Mts., Inyo Co., Calif. (May 30, 1937, E. C. Van Dyke). It is of interest, not only as the first Californian record of the species, but also because it gives an idea of the variation of the parameres in this species. In the two types these were reduced to a pair of thick semicircular structures; in the new specimen they are decidedly flatter and contain some vestiges of the ridges present in most other species of *Agulla.* The harpogones, however, are exactly like those of the types, there being a large lobe just below the curved tooth. This is the most obvious characteristic of the species, and since there was no figure of it in my revision of the Raphidiodea (Proc. Amer. Acad. Arts Sci., 71: 89–157), one is included here (figure 1B).

Inocellia inflata Hagen

In the California Academy of Sciences there are two specimens (♀♂) from Utah, St. George (May 28, 1935, E. C. Van Dyke) and Mt. Carmel (May 30, 1935, E. C. Van Dyke). These are the first records of the species or of the genus in the state.

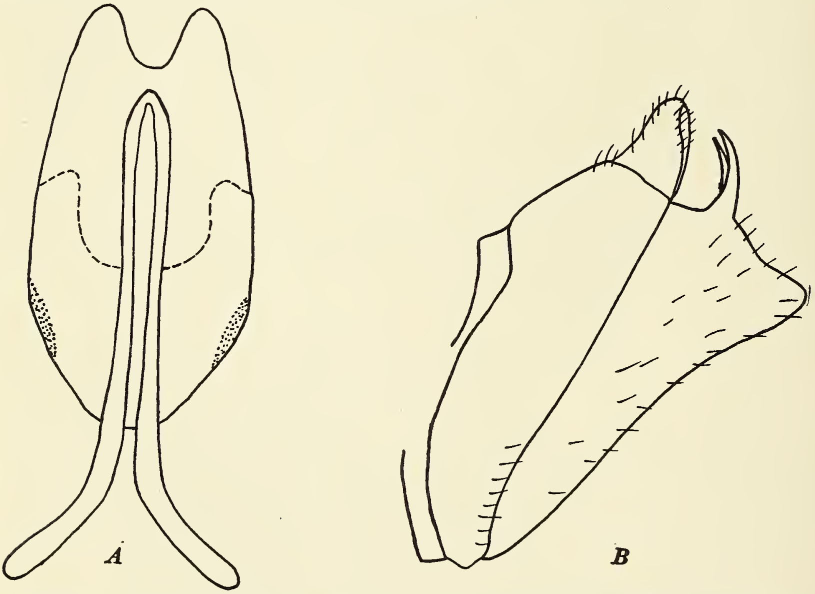

FIG. 1. A, *Panorpa neglecta* Carp., internal skeleton of ninth segment of female (allotype). B, *Agulla flexa* Carp., terminal part of abdomen, showing distal lobe of harpogones; drawn from holotype (♂).

A LIST OF ROBBER FLIES FROM COAHUILA, MEXICO (DIPTERA: ASILIDAE).

By Rollin H. Baker, College Station, Texas.

While on a field trip during the summer of 1938 in northern Coahuila, Mexico, intended primarily for the purpose of obtaining vertebrates, some 220 specimens of Asilidae including 30 species were collected. The most collecting was done in and between two mountain chains extending north and south, the Sierra del Carmen on the west and the Sierra de los Burros on the east with Muzquiz as the most southern point attained. Specimens were also obtained as far north as the Coahuila-Texas border at Fuente and San Carlos.

This region of northern Mexico is quite similar in topography and vegetation to the Trans-Pecos area of western Texas. Specimens were collected at altitudes varying from about 800 feet in the Lower Sonoran Life Zone to near 7000 feet in the Transition Life Zone.

The writer wishes to thank Mr. Ernest G. Marsh, Jr., of the University of Texas, under whose direction the trip was undertaken, and Dr. Stanley W. Bromley for identifications.

The following is an annotated list of species from northern Coahuila, Mexico:

Leptogaster arenicolus James. Two specimens. Serrino, Rancho La Buena Vista, Sierra del Carmen, elevation 5500 feet, July 18. This delicate robber fly was taken in sweepings from a weedy pasture along an arroyo.

Ospriocerus abdominalis Say. Fifteen specimens. Sierra de los Burros, elevation 4000 feet, June 18; Sierra del Carmen at Puerta de la Goriona, elevation 4900 feet, July 13, Rancho La Encontada, elevation 5200 feet, July 22, and Mesa del Hillcoat, elevation 7000 feet, July 25. This species was especially abundant on the extensive flats surrounding the hacienda of the Rancho La Encontada.

Ospriocerus minos Osten Sacken. Two specimens. Sierra de los Burros, elevation 4000 feet, June 18; Puerta de la Goriona, Sierra del Carmen, elevation 4900 feet, July 13.

Stenopogon aeacidinus Williston. Four specimens. Rancho Las Ruscias, Muzquiz, elevation 1700 feet, August 3. This fly was a rather common one in the region around Muzquiz.

Stenopogon latipennis Loew. Three specimens. Fuente, elevation 800 feet, June 12; La Babia, elevation 2500 feet, June 20.

Microstylum galactodes Loew. One specimen. Sierra de los Burros, elevation 3000 feet, June 18. This fly was collected in the northern foothills of these mountains in typical Lower Sonoran county.

Microstylum morosum Loew. One specimen. Rancho La Buena Vista, Sierra del Carmen, elevation 5000 feet, July 13. This magnificant species was observed in weedy undrained areas on the broad flat which is surrounded by higher land of the Sierra del Carmen.

Saropogon combustus Loew. Four specimens. Sierra del Carmen at Serrino, Rancho La Buena Vista, elevation 5500 feet, July 18, and Rancho La Encontada, elevation 5200 feet, July 22.

Diogmites angustipennis Loew. One specimen. Rancho Las Ruscias, Muzquiz, elevation 1700 feet, August 3.

Mallophora (*Mallophorina*) *acra* Curran. Two specimens. La Babia, elevation 2500 feet, June 20; Rancho La Buena Vista, Sierra del Carmen, elevation 5000 feet, July 7.

Mallophora (*Mallophorina*) *prudens* Pritchard. Three specimens. Sierra del Carmen at Rancho La Buena Vista, elevation 5000 feet, July 7 and Mesa del Hillcoat, elevation 7000 feet, July 25.

Promachus painteri Bromley. Three specimens. Sierra del Carmen at Serrino, Rancho La Buena Vista, elevation 5500 feet, July 18, and Mesa de la Encontada, elevation 7000 feet, July 21.

Promachus magnus Bellardi. Two specimens. Rancho Las Ruscias, Muzquiz, elevation 1700 feet, August 3.

Promachus giganteus Hine. Seventeen specimens. La Babia, elevation 2500 feet, June 20. This is an abundant species in the Lower Sonoran Zone.

Promachus oklahomensis Pritchard. Two specimens. Sierra del Carmen at Rancho La Buena Vista, elevation 5000 feet, July 12, and Mesa del Hillcoat, elevation 7000 feet, July 25. This species is fairly abundant in weedy undrained areas on the broad flat previously mentioned.

Erax candidus Coquillett. One specimen. Sierra de los Burros, elevation 4000 feet, June 18.

Erax pilosus Hine. One specimen. Puerta de la Goriona, Sierra del Carmen, elevation 4900 feet, July 13.

Erax belfragei Hine. Two specimens. Serrino, Rancho La Buena Vista, Sierra del Carmen, elevation 5500 feet, July 18. This fly was taken in sweepings from weeds along an arroyo.

Erax tuberculatus Coquillett. Fifteen specimens. Sierra de los Burros, elevation 4000 feet, June 18; La Babia, elevation 2500 feet, June 20; Rancho La Buena Vista, Sierra del Carmen, elevation 5000 feet, July 7. This robber fly was collected in rocky environments.

Erax barbatus Fabricius. Twenty-five specimens. La Babia, elevation 2500 feet, June 20. This species was taken in arid desert regions around the mountains.

Erax sp. (*barbatus* group). Two specimens. La Babia, elevation 2500 feet, June 20.

Erax armatus Hine. Three specimens. Sierra de los Burros, elevation 4000 feet, June 18; La Babia, elevation 2500 feet, June 20; Rancho La Encontada, Sierra del Carmen, elevation 5200 feet, July 22.

Erax argentifrons Hine. Fifty specimens. Sierra de los Burros, elevation 4000 feet, June 18; La Babia, elevation 2500 feet, June 20; Sierra del Carmen at Rancho La Buena Vista, elevation 5000 feet, July 7, and Puerta de la Goriona, elevation 4900 feet, July 13; Rancho Las Ruscias, Muzquiz, elevation 1700 feet, August 3. This species is general in occurence from the lowest to the highest regions.

Erax texanus Banks. Fifty-four specimens. San Carlos, elevation 950 feet, June 14; Sierra da los Burros, elevation 4000 feet, June 18; La Babia, elevation 2500 feet, June 20; Sierra del Carmen at Rancho La Buena Vista, elevation 5000 feet, July 7, and Puerta de la Goriona, elevation 4900 feet, July 13. This species was observed from the Rio Grande border south to Muzquiz.

Erax grandis Hine. Four specimens. Sierra de los Burros, elevation 3000 feet, June 18; La Babia, elevation 2500 feet; Rancho La Golondrina, Muzquiz, elevation 1600 feet, June 28. This fly is typical of the desert area.

Erax sp. near *willistoni* Hine. One specimen. Mesa del Hillcoat, Sierra del Carmen, elevation 7000 feet, July 25.

Asilus compositus Hine. Four specimens. Sierra del Carmen at Rancho La Buena Vista, elevation 5000 feet, July 7; Cañon del Hillcoat, elevation 7000 feet, July 10; and Mesa del Hillcoat, elevation 7000 feet, July 25. This species was taken in luxuriant vegetation.

Asilus tenebrosus Williston. Two specimens. Sierra del Carmen at Rancho La Buena Vista, elevation 5000 feet, July 7, and Cañon del Hillcoat, elevation 7000 feet, July 10.

Asilus avidus V. d. Wulp. One specimen. Rancho la Buena Vista, Sierra del Carmen, elevation 5000 feet, July 7.

Buckellia lutzi Curran. Two specimens. Serrino, Rancho La Buena Vista, Sierra del Carmen, elevation 5500 feet, July 18. This species was collected in sweepings along a weedy arroyo.

A New Insect Introduction.—On April 11, 1939, the writer found an insect infestation on fenugreek (*Trigonella foenum-graecum* L.) and alfalfa (*Medicago sativa* L.) at Yuma, Arizona. This appeared to be the alfalfa weevil (*Hypera postica* Gullenhal). Specimens were sent to Mr. C. F. W. Muesebeck of the Bureau of Entomology and Plant Quarantine at Washington, D. C. Mr. Muesebeck referred the specimens to Mr. L. L. Buchanan for study. The latter determined them as *Hypera brunneipennis* Boheman, originally described from Egypt and also recorded from Ethiopia. So far as known, this is the first record of the collection of this insect in the United States.

Subsequent collections were made at intervals during the next two weeks. The weevils were found feeding on alfalfa and sour clover (*Melilotus indica* All.) in fields and ditch banks on both sides of a road for a distance of about eight miles. Larvae, pupae in cocoons and adults were collected.—LAWRENCE PAUL WEHRLE, University of Arizona, Tucson, Ariz.

BOOK NOTE.

Evolution of the Annelida, Onychophora and Arthropoda, by R. E. Snodgrass. (1938. Smithsonian Miscellaneous Collections, vol. 97, no.6, pp. 1–159.)

Again Dr. Snodgrass adds to the knowledge of the metameric groups, their origin and relationships. To adequately discuss this paper would call for the same vast knowledge and deep acquaintance with the subject possessed by its author. Here, we merely cursorily point out the content of this monograph. Beginning with the hypothetical annelid ancestors, he traces the development of the three groups, supporting his findings by studies of early developmental stages of the embryo and other morphological evidence. A lengthy discussion of the conclusions derived from the evidence summarizes the results. J. R. T.-B.

BOOK NOTES.

An Ecological Glossary, compiled by J. Richard Carpenter. (Pp. i + viii + table of contents + pp. 1–306; appendix of 14 pp. unnumbered, with 3 maps. University of Oklahoma Press, Norman, Oklahoma. $4.00.)

Before all else, this reviewer, as a working glossarist, registers his entire approval of this work as such. It is one of those toilsome things which needs to be done in all disciplines of Biology, in order to bring together and make available an ever-growing, if not always happily so, extensive and diffusely scattered terminology. In this view, ecologists should register strong approval of this work; and so should every working biologist. The labor and cautious care entailed in the production of such a work as this are vastly greater than the final product reveals.

I also wish to point out Dr. Carpenter's excessive modesty in indicating himself as a mere compiler. The one that makes a lexicon of any sort goes far beyond mere compilation—his task demands judgment, skill, a nice sense of words to make meanings lucid. Were we to put in practice this modest estimate, an historian is a compiler; a chemist writing a general treatise; in fact, anyone who in any way assembles and correlates source-material is a compiler. This leaves the field of originality entirely to imaginative writers, who weave their tapestried words in the mind, divorced from actuality.

Dr. Carpenter's preliminary essay on "The Development of Ecological Nomenclature" is well worth reading and pondering, especially so the six principles set forth by the committee on Nomenclature of the Ecological Society of America, the first and last principles particularly. Many biologists in the general sense still appear to believe, as once was said, that he who invents a new term has added measurably to the content of Science. Thus, we find in our own "Glossary of Entomology" new terms for structures or for functions for which there were already anything from one to six and eight antecedent terms in being for the same thing. This comes painfully near to the absurd.

As to the method and system of Dr. Carpenter's glossary, we should have preferred to see the terms set in a different type-face from the body of the definitions. The binding of the book also is possibly too stiff for easy use of a volume meant for reference. These will doubtless be corrected in future editions.

This work is a requisite in any working biological library, even though librarians, who are not biologists, would rather decorate their shelves with some lighter tome on The Life and Loves of the Elephant, which might be more picturesque, even though not so highly useful.

Atlas of the Scale Insects of North America, by Gordon Floyd Ferris. (Pages not numbered, plates and explanatory matter. Stanford University Press, Stanford University, Calif. Unbound, $7.75; bound, $8.75.)

The reviewer, not being a coccidologist, will make no attempt to pass upon Dr. Ferris's findings. On the other hand, this is a work which will stand as a landmark in the real progress of American entomology. On this phase I base my remarks.

Outstanding today in American Entomology is the flood of new species and the numerous partial papers on various aspects of the science. There are, naturally, exceptions to this generalization, but anyone who reads our entomological journals cannot fail to realize the condition. Perhaps it is a necessary phase of entomology, like growing-pains, or budding whiskers. Perhaps, too, the enormous labor demanded to correlate and bring order out of this chaos, deters all but the most tenacious spirits from taking on the toilsome task. Dr. Ferris is not one of those who fears: he has done where others meditate. His Atlas puts on a firm basis the scale insects as objects of study; his magnificent drawings are so plain that even a lowly heteropterologist might venture to endeavor to name a casual coccid with a feeling of modest assurance.

We hold down the rampant editorial spirit, and forego comment on typography and other minutiae dear to conservative souls. But in spite of any minor and captious cavillings, this *is* a great and invaluable work. The splendor of the plates alone, their clarity, their precision, make this work a model for us poor souls who are striving in our lesser ways to clear away the scaffolding and clean up the debris, which obscure the beauty and clean lines of the edifice of Entomology.

Biological Survey of the Mount Desert Region—Part VI—The Insect Fauna, by William Procter. (The Wistar Institute of Anatomy and Biology, Philadelphia. Pp. 1–496. 1938. 1 map. 1 portrait, 11 illustrations.)

The Insects of North Carolina, being a List of the Insects of North Carolina and Their Close Relatives, by C. S. Brimley. (Pp. 1–560. North Carolina Department of Agriculture, Raleigh, N. C.)

In these we have two distributional and faunistic works, which in body are on a similar plan, but in approach are somewhat different. Their usefulness in the study of distribution and in making permanent the record of the present status of insect populations is incontestable. The other two works of a similar nature are, of course, Smith's Insects of New Jersey, and The Insects of New York.

Dr. Procter's work begins with a study of the physiography and flora of Mount Desert Island, on both of which features the insect fauna so largely depends. He lists 311 families, 2275 genera and 5465 species, the last as against about 16,000 enumerated from New York. This work has an index down to genera (not to species). The volume itself is on excellent paper and very well bound. The first plate is a portrait of the late C. W. Johnson, to whom the work is dedicated.

Dr. Procter is to be highly congratulated on this fine and useful book.

Insects of North Carolina is much on a standard plan—in fact, in general style it resembles Smith's justly famed List. In Dr. Brimley's work the total listed is more impressive, namely, 9566 species of insects. This is about two-thirds of those listed from New York State, but, as Dr. Brimley appositely remarks: "What we need to increase our list is not more insects but more entomologists." This remark applies to the entire United States. I would amplify it to read "more *amateur* entomologists." For, after all, the professional entomologists are mostly circumscribed by rules and regulations, and their time is consumed in routinary work, which leaves but little opportunity for casual collecting in occasional places, or for hours to be devoted to digging out one tiny specimen from a mound of debris. The amateur, being unfettered and unbound, goes where he pleases, collects what he pleases, and studies what he pleases, without thought of any burdensome duties to be done in the pursuit of a profession, and without regard to the utility of what he is doing. The amateur is *free!*

Let us hope for more Dr. Procters and Dr. Brimleys to push forward the badly needed country-side survey of our insect fauna while there is any left in approximately a natural condition, and before man's improvements either abolish or radically change insect populations and their habits. J. R. T.-B.

PROCEEDINGS OF THE SOCIETY.

Meeting of March 10, 1938.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, March 10, 1938. President William T. Davis presided, calling the meeting to order at 8:20 P.M. Eleven other members were present, namely, Dr. Dietrich and Dr. Tulloch, and Messrs. Buchholz, Dietz, Engelhardt, McElvare, Nicolay, Rau, Sheridan, Siepmann and Stecher. Five visitors were present, namely, Miss Dietz, and John Elfstrom, James T. Farrelly, Jr., Richard Fisco, and Dr. A. Glenn Richards, Jr.

Mr. Engelhardt presented a favorable treasurer's report, and spoke briefly for the Publication Committee, discussing the delays in the current numbers of the Bulletin and Entomologica Americana. He also read an announcement from Dr. Comstock of the Los Angeles Museum stating that they were publishing a new check list of Macrolepidoptera. There was also a letter from the Brooklyn Botanical Garden, extending an invitation to the society to hold their meetings at the Botanical Garden if they should care to do so.

Mr. Engelhardt reported attending a meeting of the Cambridge Entomological Society, and enjoyed their informal meetings very much. He also conveyed the regards of Dr. Bequaert and Mr. Banks to the members of the society.

Mr. Hans Stecher exhibited a pair of the beetle *Dendroides concolor* (*Pyrochroidae*). He collected one male and one female on June 27, 1937, in company with Mr. Ernest Shoemaker at Mt. Mitchell, North Carolina, by beating from mountain maple then in flower. It was the only pair collected during the two weeks stay. This beetle is not rare in New England and New York State. It has been recorded from Flushing, L. I., but not from Staten Island. The record from North Carolina is of interest because it does not appear to have been recorded so far south.

Mr. Richard Fisco exhibited 16 specimens of the Scarabaeid beetle, *Phanaeus carnifex* dug up from beneath human excrement on May 22, 1937, at Richmond, Staten Island, N. Y. This fine insect is not a new record, but it is becoming rare locally, and it is not found very often.

The speaker for the evening was Mr. Buchholz, who presented a paper on Lepidoptera of the genus *Eubaphe*. In 1889 John B. Smith wrote that this genus was in a sad state, and that although it was impossible to satisfactorily identify species, new species were constantly being described. Today, Mr. Buchholz said, the condition is little better. The only way to solve the problem is to breed specimens. He has already bred all of the eastern forms himself, but in order to clear up the matter, it is necessary to breed the western species, and he is desirous of getting breeding material. Females from which to get eggs for breeding purposes, however, are not so easy to get. On one occasion a series of specimens collected consisted of 60 males and only 4 females. Such disparity in the sexes is frequent. This is because it is not easy to disturb the females, and they stay close to the ground. The only way to get them is to strike a place where the males are abundant, and persist long enough until females are found.

Breeding them is a simple matter. The eggs are simply dropped by the female. When the larvae hatch they are so small that they are practically invisible. Mr. Buchholz puts the eggs in a vial. When the first one hatches, he prepares a pair of small glass trays, such as are used in chemical laboratories and are known as Petri dishes. These dishes come in pairs, one fitting over the other. He puts a sheet of paper in the bottom dish, and on top of the paper a leaf of dandelion. If a larger dish were used, the dandelion would not stay fresh for more than an hour or two. All of the species of *Eubaphe* can be raised on dandelion.

Into this dish he puts the newly hatched larvae. The next day he puts a fresh piece of paper and a fresh leaf of dandelion in the top half of the dish, and turns the whole thing upside down. The larvae always go to the bottom leaf. This procedure is kept up for a week or ten days until the larvae are large enough to be seen.

Mr. Buchholz exhibited 800 specimens of all known North American species, and bred specimens of all eastern species of this genus. At the top of each series was the female or the pair from which they were obtained. Bred specimens are always slightly larger than their parents or than those that breed in nature. Contrary to what seems to be the usual case in Lepidoptera, the southern specimens of this genus are smaller than the northern ones.

Another interesting thing is that while the black bands on specimens of the same species vary much in outline, all the specimens bred from the same female will have the black band of the same shape. This was well illustrated by the series of specimens Mr. Buchholz showed. In one case the female had a break in the black band, and all the specimens reared from her eggs had exactly the same break in the band.

The meeting adjourned at 9:30 P.M.

Carl Geo. Siepmann,
Secretary.

EXCHANGES

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

DIURNAL LEPIDOPTERA.—Have many desirable western species to exchange, including *Argynnis atossa, macaria, mormonia, malcolmi, nokomis; Melitaea neumoegeni; Lycaena speciosa;* etc. Send lists. Dr. John A. Comstock, Los Angeles Museum, Exposition Park, Los Angeles, Calif.

CATOPINI: *Catops (Choleva), Prionochaeta, Ptomaphagus.* —Wanted to borrow all possible specimens of these genera from North America for a revisional study. Correspondence solicited. —Melville H. Hatch, Dept. of Zoology, Univ. of Wash., Seattle, Wash.

BUY OR EXCHANGE: Pinned Microlepidoptera and papered Pieridae of North America. Full data with all specimens. Named material of all groups offered. Alexander B. Klots, College of the City of New York, New York City.

EXCHANGE OR FOR SALE.—*Catocala herodias* (Gerhardi), *Graptolitha viridipallens* and others. Wanted: Rare N. A. Macro-Lepidoptera. F. Lemmer, Lakehurst, N. J.

WANTED.—North American CHRYSIDIDAE for exchange or determination, with privilege of retaining duplicates. W. G. Bodenstein, Dept. Entomology, Cornell University, Ithaca, New York.

PENTATOMIDAE: Want to buy or exchange Petatomidae from the United States and Mexico. Herbert Ruckes, College of the City of New York, 17 Lexington Ave. N.Y.C.

LOCALITY LABELS—5 in strip, 1 to 3 lines. 75c per thousand. Pamphlet price list, samples upon request. Any size type. 3½ point, $1.00 per thousand. George F. Michels, Printing—604 Hollenbeck St., Rochester, N. Y.

ACALYPTRATE DIPTERA OF THE WORLD wanted for determination or in exchange for other insects. Geo. Steyskal, 23341 Puritan Ave., Detroit, Mich.

LOCALITY LABELS.—3½ or 4 point type; 40c per five hundred, 60c per thousand, 40c for each additional thousand, same type. Type labels on colored paper 10c extra. Good paper, clean work, no trimming. The Nature Co., Box 388, Lawrence, Kansas.

Vol. XXXIV OCTOBER, 1939 No. 4

BULLETIN

OF THE

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SEP 28 1939
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J. R. de la TORRE-BUENO, Editor
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The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

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REMARKS ON THE SUBGENUS TIVARBUS STÅL OF THE GENUS HYALYMENUS A. & S. WITH DESCRIPTIONS OF FIVE NEW SPECIES (HEMIPTERA, ALYDIDAE).

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In identifying the United States species of *Hyalymenus* A. & S., subgenus *Tivarbus* Stål, several facts emerged, which are here presented in a preliminary way.

Tivarbus Stål 1859 might seem to be of full generic status. In this subgenus the corium is distinct and coriaceous and heavily punctured throughout, either linearly or confusedly, while in *Hyalymenus* A. & S., s.s., it is pellucid, that is, clear or semitransparent, with the punctures restricted to the corium at the veins. Genera have been established on less significant characters than these, and have been accepted as valid.

In my view, genera which are sharply delimited by one or more outstanding characters have the nature of a full genus. For, if such character or characters be so fluctuating that it becomes impossible to put intergrades into one or the other subgenus, such characters break down as differential structures and all sense of fixity of the category disappears. All we then have are extremes fluctuating about a norm.

This is said merely to draw attention to this segregation of groups. The proper place for a definitive discussion of these two segregates is in a sadly-needed monographic revision of the genus *Hyalymenus*.

In determining species, we are confronted, as ever, with nothing to go by except the entirely inadequate and sketchy early descriptions, which seem not to have been controlled by any worker since their dates. One could mention numerous species in other groups, with long lists of references, all harking back to the original and early description, the only one extant. The fact is, that most identifications of species by an original description belong in the class of acts of faith.

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In *Tivarbus,* the original and secondary specific descriptions (when there are such), agree in two respects. All revel in color in a genus which is singularly uniform in this respect; variations in lightness or darkness of color appear to be intraspecific, as in the mass of the alydine group. The other respect is the careful citation of group characters as specific, if any structures are mentioned in the description, together with the total omission of truly specific structural characters. Exception is made in this last statement of Van Duzee's *H. subinermis,* in which more significant characters are named than in any other to its date.

The most commonly employed structures in descriptions of *Tivarbus* have been the humeral spines, the femoral spines, the absence or presence of crenulations or teeth at the middle of the curved posterior tibiae of the male, the spines of the apical angles of abdominal segments II–VI, in the male; the coloration of the venter, and the presence of light-colored pleural spots in both sexes.

Of these, the humeral spines vary more or less intraspecifically, both in length and in direction. However, their presence or absence is a reliable specific character. The patterns of the venter and of the pleura, or their absence are also good group characters.

But these primary characters are either group characters, as said, or else restricted to one sex only, the male. In the latter class belong the spinousness of the femora, the spines of the connexivum, and the crenulate hind tibiae. In all the females known to me these tibiae are slender and unarmed and slightly curved, and the angles of the abdominal segments unspined. Common to both sexes are: the comparative dimensions of the head and of the pronotum, the proportions of the antennal segments (although these have intraspecific variability within the limits of the specific), and the length of the rostrum and of its segments.

One outstanding fact in all the descriptions of *Hyalymenus* (*Tivarbus*) known to me is that, with the sole exception of *puncticeps* Dallas, they appear to have been drawn up from males only. The greater number of the characters used, either male or general, are group characters, as may be seen from the key and from the systematic arrangement of the species. This condition certainly does not facilitate the naming of species; likewise, it makes it practically impossible to name females.

This state of affairs leads me at times to wish, with an eminent British dipterist, that all types be destroyed and that every description unintelligible without the type specimen be invalidated. Of course, this would open up a vast field to sufferers from the *mihi* itch, but the consolation is that these sufferers would be handicapped by the stern fact that *they* too would have to draw up intelligible and accurate descriptions—a laborious, ungrateful and discouraging task, at best.

Another outstanding fact about these descriptions—and many others in all Orders—is the vagueness of the locality data—Brazil, Peru, Bolivia, Guiana—indications of surpassing looseness in the South American entomofauna. Geographically, the interior of all these political entities lies in the Tropical Rain Forest of the Amazon Basin; but other parts are coastal, mountainous, or arid. Naturally, the fauna and the flora of this Basin show no difference; and such national indications have no special biological significance. This is not the place to elaborate on this fact; it is merely pointed out as a warning.

TECHNIQUE AND REMARKS.

The new descriptions and the redescriptions of the older species that were available have been made under the binocular microscope. All structures and characters mentioned are visible at × 20 magnification. All measurements are by eye-piece micrometer; proportional units are 1/20 mm. each. Hence, to get the length in millimeters of any structure or segment, divide the number of units by 20.

All descriptions are drawn up on a uniform plan; and any species is directly comparable with any other species described, character for character.

All types are in collection of the author.

N. B.—The length of the abdomen, as stated in the descriptions, is conventional, measured dorsally from the apex of the scutellum to the apex of the abdomen, *not* of the membrane.

The full references to the old species are to be found in Lethierry and Severin's Catalogue des Hémiptères, and in Van Duzee's Catalogue of 1917. The few synonymic notes are subsequent to these.

Genus *Hyalymenus* A. & S. 1843.

s. g. *Tivarbus* Stål 1859.

Preliminary Key to Species.

1. Humeri acute, or subacute, not spinose *2*
   Humeri produced into distinct long spines *3*
2. Rostrum attaining posterior margin of the *intermediate* coxae, segments I and II equal, each twice as long as III; antennal segment IV about one-fifth longer than I and II taken together; pronotum about one and one-quarter times as

wide as its median length, one and three-fifths times as long as the scutellum and two and one-half times as wide; length, 13.65 (–17 mm., males, sec. Van Duzee), width, 2.75 mm. (female) .... *subinermis* Van Duzee
Sonora and Lower California, Mexico; Arizona (!).

Rostrum passing intermediate coxae or reaching or passing posterior coxae, segments I and II equal, each less than twice the length of III; antennal segment IV more or less one and one-third the length of I and II taken together; pronotum one and one-half times as wide as its median length, about one and one-half times as long as the scutellum and about two and two-thirds times as wide; length, 15.5–17.45 mm., width 3.25–3.75 mm. (males).
dissimilis n. sp.
Tamaulipas, Mexico.

3. Base of pronotum medially, *with* a small calloused spot, generally pale; pro- meso- and metapleura near the acetabula with a large smooth white or flavescent spot, calloused or not, which is sometimes absent on the propleura; posterior femora in both sexes below without tubercles or spines to the base from the spine or spines at middle, posterior tibiae in the male serially crenulate, tuberculate or bluntly dentate below at the middle of the curve, simple in the female *4*

Base of pronotum *without* a median spot; pleura *without* large *pale* spots; posterior femora in the male *tuberculate* for their entire length, posterior tibiae in both sexes simple, entire at the middle, neither crenulate nor tuberculate . . *9*

4. Venter *with* a broad white or pale median vitta on segments III, IV and V; antennal segment IV more than twice the length of I *5*

Venter *without* a broad white or pale median vitta, concolorous; segment IV of antennae twice, or *less* than twice, the length of I *8*

5. Male femora with a short thick high black carina, sometimes obsolete or showing as coarse black spines, before the apical series of spines; rostrum reaching to or going *slightly* beyond the *intermediate* coxae *6*

Male femora with only the two black apical spines and between them a series of short blunt black teeth, which two spines are preceded by one, two or three short spines of varying lengths; carina, if present, low and narrow; rostrum going *much* beyond the intermediate coxae and reaching, or nearly reaching, the posterior coxae *7*

6. Pronotum nearly one and one-half times as wide as its median length; antennal segment IV three times as long as II or III, which are equal; humeral spines slender; apex of scutellum acute; basal pronotal teeth *short,* acute, white-tipped; length, 13.25–17 mm., width, 2.5–3.25 mm. *tarsatus* Fabricius
Texas, Arizona, California; Brazil to Mexico.

Pronotum less than one and two-fifths times as wide as its median length; antennal segment IV *less* than two and one-half times as long as II or III, which are *equal;* humeral spines stout; apex of scutellum narrow, broadly rounded at the tip; pronotal basal teeth *long,* acute, white-tipped; length, 15 mm., width, 3.25 mm. **pholcopus** n. sp.
British Honduras.

7. Head shorter than or subequal to the median length of the pronotum; pronotum, including spines more than one and three-quarters times as wide as its median length; antennal segment IV about two to two and one-eighth times the length of I; apex of rostrum reaching about midway between the intermediate and the posterior coxae, or to the anterior margin of the posterior; length, 10.5–14.25 mm., width, 3.5–4.2 mm. .... *longispinus* Stål
West Indies, Florida (?).

Head nearly as long as the pronotum; pronotum including the humeral spines about one and one-fifth times as wide as its median length; antennal segment IV nearly two and one-half times the length of I; apex of rostrum reaching the *posterior* coxae; length, 12.2–13.3 mm., width, 2.6–2.9 mm. .... **tenuitibiis** n. sp.
British Honduras.

8. Antennal segment II *slightly longer* than III, IV *twice* as long as I; pronotum, including the spines, twice as wide as its median length; length, 13.0–15.75 mm., width, 4.1–4.5 mm. .... **notus** n. sp.
Florida.

Antennal segments II and III *equal,* IV *one and three-quarters* times the length of I; pronotum, including spines, *less than* twice as wide as its median length; length, 13.75–16.35 mm., width, 3.75–4.5 mm. .... **potens** n. sp.
Florida.

9. Venter black with a flavotestaceous margin; length, ?. *limbativentris* Stål
Brazil.

Venter entirely flavotestaceous or whitish *10*

10. Posterior tibiae fulvous, the apex sometimes darkened; (antennae nearly as long as the thorax and abdomen taken together, segment IV nearly two and one-quarter times as long as I; apex of the rostrum reaching nearly or quite to the posterior coxae; posterior tibiae sulcate in both sexes; membrane not exceeding the apex of the abdomen; length, 14–15.8 mm., width, 2.6–3.1 mm.) *puncticeps* Dallas
Brazil, Guiana.

Posterior tibiae black (in male only?) *11*

11. Male femora with a large tubercle at the middle below; posterior tarsi pale; spines of male ventral segments smaller on III and V than on IV and VI; (anterior femora with two subapical spines; posterior coxae, mesosternum, disc of metasternum, and apical quarter of the posterior femora, black); length, 17 mm., width, 3 mm. ..... *pulcher* Stål
Honduras.

Male femora with a short nutant black spine at about the middle below; posterior tarsi black; spines of male ventral segments III, IV and V shorter than on VI; length, 16 mm., width, 3 mm. .... *sinuatus* Fabricius
Colombia, Guiana.

Omitted from Key:
H. aterrimus Breddin 1903—Bolivia.
H. calcarator Breddin 1904—Bolivia.

ARRANGEMENT OF THE SPECIES OF TIVARBUS STAL

- Humeri acute, not spined
    - *subinermis* Van Duzee 1923
    - *dissimilis* Torre-Bueno 1939
- Humeri spined
    - Pleura *without* light-colored spots
        - Venter *concolorous*
            - *puncticeps* Dallas 1852
            - *sinuatus* Fabricius 1803*
            - *pulcher* Stål 1870*
        - Venter *black* with a light colored margin
            - *limbativentris* Stål 1870*
    - Pleura *with* light-colored spots
        - Venter *concolorous*
            - *potens* Torre-Bueno 1939
            - *notus* Torre-Bueno 1939

Venter *with a broad light colored median vitta,* complete or not
- *tarsatus* Fabricius
- *tenuitibiis* Torre-Bueno 1939
- *pholcopus* Torre-Bueno 1939
- *longispinus* Stål 1870

Unknown to me, hence unplaced:
- *aterrimus* Breddin 1903
- *calcaratus* Breddin 1904

N. B.—Species starred are placed according to description and comment by authors.

Description of Species.

Hyalymenus (*Tivarbus*) *subinermis* Van Duzee.

1923—Proc. Calif. Ac. Sci. (4th ser.) XII: 134.

This species was described from six males, from the State of Sonora, Mexico. The description largely falls into two parts: one consists of the male sexual characters—genitalia, hind legs, etc.; and the other is a comparison with *H.* (*T.*) *tarsatus* Fabricius. Hence, it is almost impossible to recognize the species without males and without authentically determined *tarsatus.* However, there are three characters given, independent of sex or of another species, namely: the *acute,* not spined, humeri; the rostrum attaining the posterior margin of the intermediate coxae; and the size. By means of these it was possible to name a female, from Tucson, Ariz., 16/IX/38, taken by R. H. Crandall. It is not strange that this species should be found in the United States, as its type localities are Upper Sonoran. No one who has travelled extensively through the northern parts of Sonora can fail to be struck by the identity with those of Southern Arizona, of the physiographic characters of the country, and of the vegetation. These, as always, transcend political boundaries and are not limited by arbitrary lines drawn on a map.

The following characters, independent of sex, are taken from the single female before me:

Head wider than long (52:43), antennal segments 32:29:30:72; *humeral angles* acute. *not* spined; *scutellum* longer than wide (25:22); *abdomen,* length: width:: 150:60 (more or less; the specimen before me is distorted, and these measurements are not exact); *connexivum* smooth, not spined at the posterior angles of the segments; *rostrum* passing the posterior margin of the intermediate coxae, segments 30:30:14:25. The differential characters between the two species with unspined humeral angles, namely, *subinermis* Van Duzee and *dissimilis* n. sp., are as in the key.

Hyalymenus (Tivarbus) dissimilis n. sp.

Head: wider than long (59:47), finely punctured above, anteriorly and below, a broad white lateral vitta from the bucculae to the base of the head; antennal segments I:II:III:-IV::45:40:40:94; apex of rostrum reaching to or passing posterior coxae, apex of I reaching to middle of eyes, II equal or subequal to I, III shortest, more than one-half the length of II, IV slightly shorter than II (32:32:18:28).

Thorax: Pronotum—about one and one-half times as wide as its median length (75:50), disc moderately finely punctured up to the anterior transverse impression, the narrow area in front of the impression finely and sparsely punctured; disc without anterior or lateral smooth raised spots; median spot of the posterior margin very small, nearly obsolete; collar narrow medially, growing wider laterally; humeri not spined, bluntly produced, a small blunt tooth on the posterolateral margin below the humeri, basal teeth at the angles of the scutellum prominent, pale-tipped, laterally curved, posterolateral and posterior margins smooth, the latter feebly sinuate. Propleura—coarsely punctured, except for an elongate calloused white area anteriorly with a few large punctures; posterior to this, vague irregular white calloused spots. Meso- and metapleura—with large white more or less elongate calloused elevated areas, which are more or less irregularly sparsely punctured, above the white areas dull with obsolete punctures; posterior margins of both these segments and *all* the acetabula coarsely punctured; scutellum longer than wide (35: 28), lateral margins broadly carinate, disc tumid with obsolete scattered punctures, more abundant apically, apical carina obsolete, apex roundedly acute, smooth, with a few coarse obsolete punctures lateral to the carina, the tip white, smooth.

Hemelytra: corium clearly punctured in more or less irregular lines; membrane hyaline, uncolored, exceeding the apex of the abdomen.

Legs: Anterior—femora simple, gradually enlarging toward the apex, with one small subapical spine; anterior tibiae simple, enlarged at the apex, sulcate internoapically; tarsi nearly two-thirds the length of the tibia, segment I longer than II and III taken together, excluding the claws. Intermediate—femora as the anterior, with two subapical spines; tibiae as anterior. Posterior—femore markedly incrassate, with a stout concolorous spine at the middle below and no other spines, a coarse strong keel apically, the subapical row of spines obsolete but for a few low tubercles; tibiae compressed but thick, curved, tuberculate on the inner margin of curve medially and terminating in a long stout spur on inner apex, on both faces a deep longitudinal groove near the inner margin, not going much beyond the curved part, and an obsolescent groove near the outer margin, between the grooves a rounded raised carina; tarsi, segment I about twice as long as II and III taken together.

Abdomen: narrow, over three times as long as wide (215:65); connexivum pale above; apical angles of segments II–VI black spined, longest on IV, on III next longest, on II and V nearly of the same size, on VI terete, blunt, nearly as large as III; margins smooth, somewhat calloused; ventral segments transversely striate at least marginally, III ivory-white medially toward its apex, IV with a smaller like spot, V with a similar broad, large long spot, the whole with a darker margin, VI much darker anteromedially, all segments pale laterally; genital segment *not* critically examined.

General color: fuscous.

Dimensions: length, 17.35 mm., width, 3.75 mm.

Type: male, San José, Tamaulipas, Mexico, April 1910, J. R. de la Torre-Bueno, collector; paratypes, 2 males, same data. Type and paratypes in my collection.

Hyalymenus (*Tivarbus*) *puncticeps* Dallas 1852.

List of Hemip. II: 476.

Head: wider than long (52: 47), finely punctured above, laterally and below finely sparsely and irregularly punctured, a lateral white vitta absent or obsolescent; antennal segments I: II: III: IV:: 52: 38: 42: 115; apex of rostrum reaching to posterior coxae, apex of I nearly reaching the anterior margin of the prosternum, I and II equal, III shortest, one-half the length of either of the first two, IV noticeably shorter than I or II (35: 35: 17: 30).

Thorax: Pronotum—about one and one-half times as wide, including the humeral spines, as its median length (62: 42), coarsely punctured up to the anterior transverse impression, the narrow transverse area in front of the transverse impression evanescently punctured, without raised white spots on disc or at base; collar narrow medially, growing wider toward the sides; humeral spines moderate, smooth, without basal minute punctures, posterolateral margin of the pronotum with a small tooth near each humeral spine, and short broad triangular teeth at the basal angles of the scutellum, posterolateral and posterior margins smooth, the latter slightly undulate and with a minute vestige of the calloused white basal spot; propleura coarsely punctate, with vague small white calloused spots anteriorly; meso- and metapleura *without* white spots, the areas occupied by these in other species finely punctured, posterior margins of both segments and the acetabula coarsely punctured (the minute white callus at the posterior acetabula mentioned by Dallas is visible) ; scutellum—about one and one-half times as long as its basal width (26: 18), lateral margins tumid except apically, where they are carinate, disc finely punctured, apically darker with deep coarse punctures and a fine nearly obsolete carina, apex acute, point blunt, smooth, white.

Hemelytra: corium coarsely punctured, more closely, deeply and linearly on the clavus; membrane brown, *not* passing the apex of the abdomen.

Legs: Anterior—femora simple, hardly enlarged toward the apex, with a small subapical spine; tibiae simple, slightly enlarged at apex with a distinct broad sulcus apically, prolonged into a fine indented line to the base; tarsi slightly more than one-half the length of the tibia, segment I twice the length of II and III taken together (without the claws). Intermediate—femora as in the anterior, with 2 subapical spines; tibiae as anterior; segment I of tarsi *not* twice as long as II and III taken together. Posterior—femora thickened from the narrow base to the apex, a black spine at the middle and two rows of smaller spines or acute tubercles linearly toward base and one row toward apex, lateral to the middle spine, which spine is preceded by another or by an acute black tubercle, terminal spines of the apical series long, intermediate spines small, blunt, gradually growing smaller and disappearing before the anterior spine of the series, no indication of a femoral carina preceding the apical series of spines; tibiae narrow, curved compressed but rounded, interior edge quite thin, but smooth, neither dentate nor crenulate, terminating in an acute apical spine on the inner apex, tibiae finely grooved or sulcate; tarsal segment I not quite twice as long as II and III taken together.

Abdomen: narrow (175: 50, not including spines) ; connexivum above pale, posterior angle of segment III tuberculate, of IV to VI spined, spine on IV longer than that on V and shorter than that on VI, which is the longest and terete, all spines concolorous with the connexivum, margins of which are smooth, slightly calloused; ventral segments *not* transversely rastrate, rugose or striate, if anything, vaguely punctured, except for three deep punctures laterally on segment IV leading from near the spiracles diagonally toward the apex of the segment, and equally distant from each other; entire venter concolorous stramineous except for a median round subapical dark spot on segment VI; genital segment *not* examined critically.

General color: fuscous, except for the stramineous venter.

Length, 14.5 × 3.1 mm.

Plesiotype: male, Mallali, Br. Guiana, H. S. Parish, Collector, Other specimens: one ♀, same data, 2 ♀♀. Bartica, Br. G., Parish.

Dallas in his description furnishes no structural characters other than the punctation and the two minute tubercles on the postpectus, together with the length, 7½ lines, or ⅝ inch, or about 15.8 mm., for his female type. The general impression of the species is that of a distinctly slender insect, with practically filiform antennae nearly as long as the whole insect from apex of the thorax to the apex of abdomen; the posterior femora in the male appear slender as compared with other species, as slender as in the female; the posterior tibiae in the male are also narrow.

Hyalymenus (Tivarbus) potens n. sp.

Head: slightly wider than long (50:45), finely obsoletely punctured above, the pale lateral area obsoletely remotely punctured, with irregular white callosities delimiting it, the remainder and below smooth; antennal segments, 57:41:41:-100; apex of rostrum reaching nearly to posterior margin of the intermediate coxae, apex of segment I extending to about middle of eyes, II longer than I, III shortest, about one-half of II, IV equal to I (25:30:16:25).

Prothorax: Pronotum—one and four-fifths times as wide as its median length (90:50), disc moderately finely punctured to the anterior depression, the narrow transverse area in front of the depression evanescently punctured, disc anteriorly with two evident white smooth raised calloused spots, close together, the lateral spots present in other species *absent,* the median white spot of the posterior margin calloused, smooth, shining; collar narrow medially, growing wider laterally, its anterior margin calloused, white, laterally with a few scattered large punctures; humeral spines moderate, not very slender, without minute basal punctures, more or less crenulate to the small posterolateral *tooth,* posterolateral margins beyond smooth to the basal teeth, which are *outwardly* bent at the narrow apex; base of pronotum between these teeth smooth, *sinuate*. Propleura—unevenly coarsely punctured to the small smooth pale anterior calloused area, the meandering lines between rows of punctures white, more or less calloused; meso- and metapleura with smooth white calloused areas, that on one mesopleura of the type small and more or less vague, on the other side large and well defined, the mesopleural areas rugose, the metapleural remotely coarsely punctate, above these white areas dull, more or less rugosely-punctate to the upper margin, posterior margins and the acetabula of both segments coarsely punctate, the anterior angle of the mesopleura with a white smooth tubercle close to the posterior margin of the propleura; scutellum longer than wide (27:20), lateral margins more or less tumid (not carinate), disc tumid with a few coarse punctures, much larger and closer together near to apex, which is white, narrow, rounded, with two or three coarse vague punctures, *no* apical carina.

Hemelytra: corium irregularly coarsely, almost foveolately, punctured; membrane more or less brown, not quite as long as the abdomen.

Legs: Anterior—femora simple, gradually enlarged toward apex, with *one* small subapical spine (sometimes absent); tibiae slightly enlarged at apex; anterior tarsi (not including the claws) more than one-half the length of the tibia, segment I longer than II and III taken together. Intermediate—femora as anterior, with *one* spine or two; tibiae as anterior. Posterior—(male) femora markedly incrassate, with one or two stout spines near middle beneath (in type, one spine on one femur and two on the other), the other usual spines absent or reduced to acute or blunt tubercles, the subapical row represented by a raised broad rounded thickening or carina; tibiae flat, moderately broad, curved, with blunt teeth or tubercles on the inner edge of the curve, with two grooves on both faces separated by a broad rounded carina, the groove on the outer side complete, percurrent, that on the inner evanescent beyond the middle toward the apex, apical spur large; tarsal segment I one and one-half times as long as II and III taken together.

Abdomen: broadened at segment IV, otherwise narrow (200:62), connexivum pale above; apical angles (in male) of segments II acute, III acute, nearly spinous; IV with a large spine (the largest), V with spine obsolete, VI with a short stout blunt spine; margins smooth, slightly calloused; ventral segments smooth, more or less calloused laterally below connexivum; pale stramineous or ivory, vaguely irregularly darkened, segment VI embrowned; genital segment *not* examined critically.

General color: fuscous; head and thorax pale, verging on stramineous.

Dimensions: length, 16.35, width, 4.5 mm. (Paratypes: length, 13.75–16.35 mm., width 3.75–4.5 mm.)

Type: male, Gulfport, Florida, A. G. Reynolds; paratypes, 5 males, 5 females; same data.

The female differs in the smooth unspined margins of the abdomen, and in the smooth inner margins of the hind tibiae, in addition to the sexual characters.

Hyalymenus (Tivarbus) notus n. sp.

(=*longispinus* T.-B. 1933. Bul. B. E. S. 28: 30, nec Stål 1870.)

Head: wider than long (48:43), finely punctured above, laterally and below smooth, impunctate, with a broad white lateral longitudinal vitta from the bucculae to the base of the head; antennal segments, 46:38:35:93; apex of rostrum reaching to posterior coxae, apex of segment I not passing posterior margin of the eyes, I:II:III:IV::40:30:16:25, II shorter than I, III shortest, about one-half of II, IV shorter than II.

Thorax: Pronotum twice as broad, including spines, as its median length (90:45), coarsely punctured, almost reticulately foveolate, up to the anterior transverse impression, the narrow area in front of the transverse impression dull, evanescently finely punctured, disc anteriorly with or *without* two smooth raised spots, but with two irregular calloused lines, and *without* the lateral small calloused spots, a median pale calloused spot on the posterior margin; collar medially narrow, impunctate, growing wider toward the sides; humeral spine long, moderately stout, acute, without fine punctures at base; a small blunt tooth on the posterolateral margins, and between this and the humeral spine a few fine teeth or acute tubercles, the rest of the posterolateral margins smooth to the broad, almost equilaterally triangular basal teeth, base of the pronotum smooth. Propleura—coarsely reticulately punctate, almost alveolate, without a white callous area, a large white tubercle anteriorly in its place; Mesopleura with a pale smooth area, having a very few large obsolete punctures, above with an irregular obsoletely punctured opaque area, posterior and upper margins raised, the area between these and the central areas coarsely punctured, the anterior angles with a large pale callus. Metapleura—with an elongate smooth pale median area, with a few obsolete punctures, above this area, a dull elongate area, obsoletely punctured and at the upper margin more or less finely rugose; posterior margin coarsely deeply punctured, almost alveolate in a triangular area; acetabula of both segments coarsely, almost alveolately, punctured. Scutellum longer than wide (27:20), disc tumid, coarsely punctured, lateral margins narrowly raised, apex very narrowly rounded, with two or three coarse punctures and *no* carina.

Hemelytra: corium very coarsely punctured; membrane infuscate, noticeably longer than the abdomen.

Legs: Anterior—femora simple, enlarging gradually toward the apex, with one *minute* subapical spine below (sometimes absent); tibiae simple, enlarged at apex, with a short evanescent apical lateral groove; tarsus, excluding the claws, slightly more than one-half the length of the tibia, segment I subequal to II and III taken together, not including the claws. Intermediate—femora as the anterior, but with only *one* (sometimes two) very small subapical spine; tibiae without an apical groove, hardly incrassate apically. Posterior—femora incrassate, spine at middle below somewhat slender, pointing apically, the spines preceding the subapical series small, sometimes changed to a short carina, more or less acute apically, the subapical series reduced to the two terminal spines or teeth, with one or two tubercles between, scattered acute tubercles on the femora laterally and apically; tibiae flat, curved, with *two* sulci and a raised rounded carina between them, a series of blunt teeth or tubercles on the inner margin, terminal spine concolorous, somewhat slender; tarsal segment I not quite twice as long as II and III taken together.

Abdomen: narrow (175: 68) (length does not include the part of the membrane exceeding the apex of the abdomen); connexivum above pale, apical angles of segments II and V acute, III, IV and VI spined, the spines about equal, margins smooth, slightly calloused; ventral segments concolorous, dark, laterally finely rugose, or striate; genital segment *not* examined critically.

General color: light fuscous, pronotum verging on testaceous.

Dimensions: Length (to tip of membrane), 15.75 mm., width, 4.5 (at humeri, including spines).

Type: Male, Key Largo, Florida, November 1931, C. G. Siepmann; paratypes, 1 male, 1 female, Matecumbe, Florida, same date, same collector.

Hyalymenus (*Tivarbus*) *tarsatus* Fabricius 1803.

Syst. Rhyng. 250.

Head: wider than long (46 : 40), finely and obsoletely punctured above, laterally and below smooth, except for a few scattered obsolete punctures, with a broad white vitta from the bucculae to the base of the head; ant. I : II : III : IV : : 44 : 32 : 32 : 95; apex of rostrum reaching or passing intermediate coxae, apex of I not passing posterior margin of the eyes, II equal or subequal to I, III shortest, one-half as long as II, IV much shorter than II (I : II : III : IV : : 27 : 25 : 13 : 18).

Thorax: Pronotum—less than one and one-half times as wide, including the spines, as its median length (65 : 45, 60 : 43), coarsely punctured up to the anterior transverse impression, the narrow area in front of the impression evanescently punctured, the disc anteriorly with two smooth raised spots close together, laterally near the margins with two other like spots and one medially on the posterior margin; collar narrow medially, growing wider laterally; humeral spines slender, acute, moderately long, *not* punctured basally, a small tooth on the posterolateral margin below the humeral spine, posterolateral and posterior margins smooth from the humeral spines, except for the two broad but small posterior teeth; propleura coarsely punctate, except for the pleural continuation of the narrow anterior area, which is not visibly punctate, and for a more or less elongate small white calloused area anteriorly, which extends onto the lateral aspect of the collar more or less broadly, a narrow calloused vitta at the posterior margin of the propleura, close to the acetabulum; meso- and metapleura smooth, with more or less callose-rugose white more or less median areas, posterior margins of *both* segments irregularly and obsoletely punctured, intermediate acetabula finely punctured, posterior coarsely; acutellum longer than wide (25 : 20), lateral margins somewhat tumid, slightly calloused, elevated above the disc, which has a few coarse obsolete punctures, which produce a longitudinally rugose effect, apical carina feeble; apex acute, feebly carinate, impunctate, smooth.

Hemelytra: corium coarsely shallowly punctate in indefinite lines; membrane embrowned, longer than the abdomen.

Legs: Anterior—femora simple, gradually enlarging toward the apex, with a small subapical spine; tibiae simple, enlarged at apex, laterally with a short apical sulcus; tarsi more than one-half the length of the tibia, segment I as long as II and III taken together (*not* including claws). Intermediate—femora as in anterior, with *two* subapical spines; tibiae as anterior. Posterior—femora incrassate, with a large black or black-tipped spine at middle below, sometimes preceded by a smaller spine, a few scattered spines sublaterally, unarmed between the median spine and a strong marked broad black carina preceding the two strong spines with a row of very small spines, teeth or tubercles between them; tibiae flat, curved, tuberculate or dentate on the inner margin of the curve medially and terminating in a long acute spine or spur on the inner apex, a lateral longitudinal groove on both faces; tarsal segment I not quite twice as long as II and III taken together.

Abdomen: Narrow (155: 50, not including spines); connexivum above paler than the disc; apical angles of abdominal segments III to VI spined, the spine on VI longest, on III smallest, concolorous, on IV longer than V, margins of connexivum smooth, rounded; ventral segments more or less finely transversely rugose or striate laterally, III, IV and V broadly white discally, producing the effect of a broad median vitta, VI much darker than the others, all segments growing paler laterally; genital segment *not* examined critically.

General color: fuscous.

Dimensions: length, 13.25, width, 3.25 mm. (including humeral spines).

Plesiotype: male, Bartica, British Guiana, H. S. Parish; other specimens, 3 males, 1 female, same data, one Mallali, B. G. All specimens compared with plesiotype.

The plesiotype has been carefully identified by Stål's redescription (Hem. Fabr. II: 62).

Hyalymenus (Tivarbus) tenuitibiis n. sp.

Head: wider than long (49: 40), finely punctured above, laterally and below smooth, with a few very small, scattered punctures, with a broad white lateral longitudinal vitta from the bucculae to the base of the head; antennal segments I: II: III: IV:: 35: 31: 31: 85; apex of rostrum reaching to posterior coxae, apex of segment I reaching nearly to anterior margin of the prosternum, II subequal to I, III shortest, slightly more than one-half the length of I, IV a little shorter than II (32: 30: 18: 25).

Thorax: Pronotum—about one and two-fifth times as broad as its median length (58: 41), coarsely punctured up to the transverse impression, the narrow transverse area before the impression evanescently sparsely punctured, disc anteriorly with two small white smooth raised spots close together, at the impression, lateral spots represented by very small lateral calli or pimples, a small, smooth, white median spot on the posterior margin; collar narrow medially, growing wider toward the sides; humeral spines relatively short, acute, without minute basal punctures, a small tooth on the posterolateral margins and a larger triangular tooth at the basal angles, posterolateral and posterior margins smooth. Propleura coarsely punctured except for a more or less elongate white calloused area, anteriorly, which extends onto the lateral aspect of the collar, which has a few deep dark punctures, the area itself with a very few obsolete shallow punctures or pits and limited to the area before the lateral impression. Meso- and metapleura with large raised white callose areas discally, remotely shallowly punctured, posteriorly coarsely punctured and above the white areas dull and remotely punctured or not smooth, acetabula coarsely punctured; scutellum longer than wide (25: 18), apex narrow, acute, white, with a vestigial carina, disc dull, sparsely shallowly punctured, lateral margins feebly carinate.

Hemelytra: corium sparsely punctured; membrane hyaline, slightly exceeding abdomen.

Legs: Anterior—femora simple, enlarging gradually toward the apex, with one small subapical spine; tibiae simple, enlarged at apex, feebly sulcate laterally apically; tarsi about three-fifths the length of the tibia, segment I about twice as long as II and III taken together, not including the claws. Intermediate—femora as in anterior, with *two* subapical spines; tibiae as anterior. Posterior—femora incrassate, with a long black-tipped spine at middle below, one large black spine preceding the subapical series, of which only the two large terminal spines persist, the intermediate being much reduced and absent toward the apical spine, laterally to the series are a few irregular scattered small spines or acute tubercles; tibiae flat, curved, narrow, obsoletely sulcate on both faces, tuberculate medially on the curve with small low tubercles, terminal spine or spur small, thin; tarsal segment I not quite twice as long as II and III taken together.

Abdomen: narrow (160: 50), connexivum more or less infuscate above; apical angle of segment III acute, IV and V with very small spines, that of IV the longer, VI longest, cylindrical, spines pale except VI; ventral segments finely striate transversely, III, IV and V medially broadly pale, IV black apically with a clouded dark area arising from the black, segments paler laterally; genital segment *not* examined critically.

General color: fuscous.

Dimensions: Length, 13.3 mm., width 2.9 mm., (humeral).

Type: male, Punta Gorda, British Honduras, March 1931, J. J. White collector; paratype, same data, 1 male.

Hyalymenus (Tivarbus) pholcopus n. sp.

Head: wider than long (55:45), above finely punctured, below smooth, impunctate, with a broad white longitudinal spot from the bucculae to the base of the head, the spot sparsely minutely punctured, more closely on the anterior area of the spot; antennal segments I:II:III:IV::45:38:38:93; apex of rostrum *not* passing intermediate coxae, apex of segment I *not* passing posterior margin of the eyes, I:II:III:IV::35:33:18:25 ±.

Thorax: Pronotum—about one and one-quarter times as wide (including the humeral spines) as its median length (65:52), very coarsely rugose-punctate up to the anterior transverse impression, the narrow transverse area in front of the impression sparsely and unevenly punctate, disc anteriorly with 2 smooth raised spots close together, laterally with irregular callose rugae in place of the callous spots; collar narrow medially growing wider toward the sides; humeral spine, short, somewhat stout, a small tooth on the posterolateral margin of the pronotum and the usual more or less broad basal tooth at each basal angle of the scutellum, posterolateral and posterior margins smooth; propleura coarsely reticulately punctate, except the *small* white calloused area, which is smooth, except for a very few (from 3 up) small marginal punctures; collar laterally white, calloused, with scattered punctures laterally and below; metapleura above the large white calloused spot, with a rounded roughened area which is shallowly punctured posteriorly and above, and the acetabula coarsely punctate; anterior angle with a large white tubercle; metapleura and acetabula similar, but *without* a tubercle at the anterior angle; scutellum longer than wide (30:22), lateral margins with a rounded carina, disc coarsely punctured, a distinct short carina apically, apex white narrow, *rounded,* smooth, with 2 or 3 evanescent punctures, but *no* carina.

Hemelytra: corium coarsely deeply punctured, membrane brown, longer than the abdomen.

Legs: Anterior—femora simple enlarging gradually toward the apex, with a small subapical spine; tibiae simple, enlarged apically, sulcate laterally toward the apex; tarsi one-half the length of the anterior tibiae, segment I longer than II and III taken together (not including the claws); Intermediate—femora as in the anterior, with two subapical spines; tibiae as anterior, feebly sulcate laterally toward the apex. Posterior—femora very stout, median spine very long and stout, preceded by a smaller spine, the series of spines preceding the apical series have the form of a bidentate black carina, the two subapical spines short, stout, the series between them very small and few in number, more like small teeth; on the inner aspect of the femur, from the median spine toward the apex, a series of acute tubercles; tibiae *wide,* flat, curved, dentate medially on the curve and tuberculate toward the apex on the inner aspect, terminating in an acute long spine or spur, the longitudinal groove on both faces broad, delimited by a lengthwise low rounded carina, segment I of tarsus about one and one-half times as long as II and III taken together (25:17), not including claws.

Abdomen: narrow (130:65), not including hemelytra; connexivum pale above; apical angles of segments III–VI produced spinously, II acuminate, spine of III curved black-tipped, of IV similar, much larger; of V small, straight, round, posteriorly directed, of VI larger, straight, round; margins smooth, slightly calloused; ventral segments marginally transversely finely rugose or striate, III, IV and V broadly stramineous discally, producing the effect of a broad median vitta, II with disc pallescent, last segment much darker, all segments laterally fuscous; genital segment *not* examined critically.

General color: dark fuscous.

Dimensions: length, 15 mm., width, 3.25 mm.

Type: male, Punta Gorda, British Honduras, March 1931, J. J. White, collector.

The type is the only specimen in hand. It is, however, very distinct, a coarser insect in facies and punctation than the other species herein described.

Hyalymenus (*Tivarbus*) *longispinus* Stål 1870.

En. Hem. I: 213. (n. n. for *sinuatus* Guerin 1857.)

Head: wider than long (48:40), finely punctured above, laterally and below smooth, impunctate, with a broad white lateral longitudinal vitta from the bucculae to the base of the head; antennal segments I : II : III : IV : : 42 : 35 : 35 : 90; apex of rostrum reaching midway between the intermediate and the posterior coxae, apex of rostr. I reaching nearly to the anterior margin of the prosternum, II equal to I, III shortest, one-half the length of II, IV a little shorter than II (I : II : III : IV : : 30 : 30 : 15 : 25).

Thorax: Pronotum about one and three-quarter times as wide, including the spines, as its median length (80 : 46), coarsely punctured up to the anterior transverse impression, the narrow area in front of the impression evanescently punctate, disc anteriorly with two smooth raised spots close together, laterally near the margins with two other like spots, and one medially on the posterior margin; collar narrow medially, growing wider toward the sides; humeral spines slender, long, with minute punctures basally, a small tooth on the posterolateral margins of the pronotum, and between this and the humeral spine a series of very small teeth, the rest of the posterolateral margins without teeth, to the somewhat broad basal teeth, the base of the pronotum between these teeth smooth; propleura coarsely punctate except for a more or less elongate large white calloused area anteriorly, which extends onto the lateral aspect of the collar in obsolete vittae and posteriorly into an indefinite number of variable-sized white smooth calli or flat irregularly-shaped tubercles; meso- and metapleura smooth, with central large raised white areas, which have a few obsolete punctures, posterior margins of both segments coarsely punctate, as well as the acetabula; scutellum longer than wide (25 : 20), lateral margins somewhat tumid, disc with a few coarse punctures, more abundant toward the apex, a feeble carina apically, apex narrow, rounded at tip, *smooth,* carinate, with a *very few* lateral coarse punctures at each side of the carina.

Hemelytra: corium very coarsely shallowly punctate in indefinite lines; membrane hyaline; longer than the abdomen.

Legs: Anterior—femora simple, enlarging gradually toward the apex, with a small subapical spine; anterior tibiae simple, enlarged apically, sulcate laterally toward the apex; anterior tarsi one-half the length of the anterior tibiae, sugment I (basal) longer than the remaining two taken together (not including claws). Intermediate legs—femora as in the anterior, with two subapical spines; tibiae as anterior, feebly sulcate *laterally* toward apex. Posterior—femora, markedly incrassate, with a black-tipped spine at middle beneath and one, or a few, scattered black-tipped spines or teeth between it and the apical series, between the spine preceding the series and the subapical series a low concolorous or black-crested carina; the usual two subapical spines with a linear row of smaller spines or teeth or tubercles between them; tibiae flat, curved, tuberculate or dentate on the inner margin of the curve medially, and terminating in a long spine or spur on the inner apex, a lateral longitudinal groove on both faces; tarsal segment I not quite twice as long as the remaining two (II and III) taken together.

Abdomen: narrow (155:49), connexivum paler than the disc above; apical angles of segments IV, V and VI with small spines, that of segment VI the longest; margins smooth, slightly calloused; ventral segments transversely finely rugose or striate, III, IV and V broadly white discally, producing the effect of a broad median vitta; last segment much darker; all segments laterally paler; genital segment *not* examined critically.

General color: testaceous, some specimens dark, verging on fuscous.

Dimensions: length, 13.5 mm., *width,* 4 mm. (at humeri, including spines); size range of other specimens 10.5–14.25 mm. width, 3.5–4.2 mm.

Plesiotype: male, Habana, Cuba; collected by F. Z. Cervera; other specimens, 6 males and 12 females, same data. All specimens compared with the plesiotype.

A METHOD OF COLLECTING NESTS OF SOME SOCIAL HYMENOPTERA.

By Albro Tilton Gaul, Brooklyn, N. Y.

It is often of value to the entomologist to obtain the nests of the social insects to study the immature brood, queens or parasites or even to remove the nest to a place where its inhabitants may be more readily observed. The following technique circumvents the hazard presented by the stinging species, yet keeps the insects in an optimum condition for study.

It is important that no attempt should be made to secure the nests except during a rainfall or in the late evening when all the members of the colony are within. If the nest is attacked in the daytime, even though the insects within may be quelled, there are inevitably some members afield who return and set up a vicious stinging campaign. Only when all the insects are within the nest should no interference be expected.

The necessary equipment consists of the following: A cardboard box large enough to hold the nest and tight enough to prevent the escape of the insects; a long pair of forceps to avoid handling the nest before anaesthetising the inmates; about 25 cc. of ether if the nest is to be reestablished elsewhere, or xylene (or any other volatile hydrocarbon) if the insects are to be killed. Absorbent cotton is used to plug the nest entrance. A knife and trowel are invaluable in securing the subterranean colonies and a flashlight is used for the more desirable night attack.

Roll the cotton into a tapering form so that it will easily block the nest entrance. Soak the roll with the anaesthetic and quickly plug the entrance. If the nest is made of paper it is also desirable to pour the remaining anaesthetic over the nest. Be careful not to shine the flashlight on the nest for too long periods as the insects, especially the Vespidae, become curious and come out; the use of some sort of red filter over the light might prevent this, but I have never found this necessary. As soon as the humming dies out it is safe to put the nest in the box.

The larvae and pupae are not visibly affected by the treatment which stuns the adults, and it is not long before the pupae will emerge. This method is particularly effective with the species of *Bremus* and *Vespula*. It is the only way I know of obtaining a number of specimens of *Vespula arctica* as this species will not leave the nest of its host, *Vespula diabolica,* when the nest is disturbed.

Species of *Polistes,* who make uncovered nests, may be taken by putting an ether soaked cotton wad in a shallow battery jar and holding it under the nest until the adults succumb, when the nest may be cut down.

Wanted.—Short notes, from 3 to 20 lines, to fill blanks such as this.—Editor.

NEW WESTERN POLYPHYLLA (COLEOPTERA-SCARABAEIDAE).

By Mont A. Cazier, University of California, Berkeley, Calif.

The author would like to express his appreciation to Dr. E. A. Chapin of the United States National Museum for the privilege of studying the Casey types in his charge. Thanks are also due R. P. Allen and E. R. Tinkham for specimens supplied.

Polyphylla squamiventris Cazier, sp. nov.

Relatively small, narrow; head and clypeus black, pronotum piceous, elytra dark reddish-brown; head clothed with hair and squamae, clypeus with squamae, pronotum squamose except for a few setae on anterior portion of disk, elytra sparsely squamose and without complete discal vittae. Head black, vertex impunctate, shining, front rather densely clothed with mixture of broad white squamae and long yellow setae, eyes bordered with dense white squamae, canthus prominent, densely clothed with squamae and yellow setae; clypeus with posterior side margins elevated above front and gradually sloping toward clypeal disk, front margin strongly reflexed at right angles with rest of clypeus and at least twice as high as side margins, outer angles prominent and sharp, disk with squamae separated by about one-half own lengths, punctures confluent or nearly so, lateral and front margins more densely clothed with broad white squamae; labrum deeply emarginate; terminal segment of maxillary palpi with flattened area, not impressed; antennae small, funicular segments plus scape approximately three-fourths length of club. Pronotum with side margins evenly rounded, straight behind, widest at middle, front angles strongly produced; median longitudinal impression and oblique lateral vittae densely clothed with overlapping, white, stout (one-half longer than wide) squamae, remainder of disk sparsely clothed with stout (one-third longer than wide) white squamae, each squama lying in a broad, round, irregularly placed puncture, side margins with squamae more dense than on disk; middle of lateral one-third with a large ovoid impunctate depression, surrounded posteriorly by rather dense squamae; front and side margins with row of long setae, anterior portion of disk with few long setae arising from large punctures. Elytra narrowly widening to apical two-fifths, gradually rounded apically; squamae small, white, robust (generally one-fourth longer than wide), irregularly, sparsely scattered over elytra except for narrow, dense band on suture, basal two-thirds of scutellum, humeri from scutellum to umbone, and an indication of a dense vitta just inside humeral umbone, and on outer apical angles; surface with irregular, shallow, rugosities, devoid of hair. Pygidium as long as broad, squamae separated by about their own lengths, most sparse medially, apically with few setae. Beneath thorax densely clothed with long brown hair except for metasternal-epimeron, and meso-episternum and inflexed pronotum which are densely squamose, apical three-fourths of abdominal segments densely clothed with squamae, forming a solid patch of white on each segment laterally, medially more sparse and not reaching side margins, apical segment sparsely squamose, with few setae along outer margin; legs piceous, sparsely squamose and pilose, anterior tibiae deeply tridentate, middle tibiae shallowly tridentate or with external processes, claw deeply cleft, tooth blunt and nearest base. Length 21 mm, width 9.7 mm.

Holotype male in the author's collection, taken at Presidio, Texas, (Rio Grande) June 1929 by E. R. Tinkham to whom the author is indebted for the privilege of making known the species.

Polyphylla squamiventris, although distinct from all other known species, appears to be most closely allied to *cavifrons* Lec. and keys to this species in both Fall's and Casey's keys. It can be readily distinguished from this species, however, by its shorter antennal club, unimpressed terminal segment of maxillary palpi, more deeply cleft labrum, more robust squamae of pronotum and elytra, more pronounced pronotal vittae, by the extremely dense squamose condition of the ventral abdominal segments and its smaller size and narrower shape. In the matter of vestiture *squamiventris* is most nearly like *hammondi* Lec. but it can be easily separated because of its much shorter antennal club, lack of clypeal setae, prominent front and hind angles of pronotum, transverse basal arrangement of squamae on scutellum and by the dense abdominal squamae.

From all the remaining species in the genus, *squamiventris* can be distinguished by its deeply tridentate anterior tibiae, a character that is somewhat variable, but which never is as pronounced in the bidentate group as in *squamiventris.* It is distinct from all others, except the species described below, by its very small antennal club and by the dense squamae on the venter of the abdomen. The latter character seems to be quite variable in other species and may prove to be so in *squamiventris.*

Polyphylla alleni Cazier, sp. nov.

Small, narrow; head and clypeus black, remainder rufous; squamose throughout, setigerous punctures confined to front of head and clypeus and disk of pronotum. Head black, front rather densely, setigerously punctate, punctures separated by about one-half their own widths, sides densely clothed with robust squamae; clypeus nearly on same plane with front, densely punctate, punctures separated by about one-third their own widths, side margins only slightly reflexed, front margin narrowly reflexed, disk shallowly concave; labrum deeply emarginate, terminal maxillary palpal segment shallowly impressed on basal two-thirds; antennae small, scape and funicular segments three-fourths as long as club. Pronotum rufous, disk irregularly, sparsely punctate with setigerous and squamose punctures, lateral vittae obscure apically, dense at base; lateral margins more densely squamose than disk; sides evenly rounded, angles not produced. Elytra narrow, widest at apical two-fifths, gradually rounded apically; surface shallowly, irregularly rugose, two discal vittae prominent but interrupted and irregular and not attaining apex, submarginal vittae prominent and less interrupted than discal vittae, sutural vittae indistinct and irregular except at extreme apex, posthumeral vittae appearing at irregular intervals; squamae of vittae more robust than those of intervals and much more dense; scutellum densely squamose at extreme base, apically with median longitudinal vitta. Pygidium densely clothed equally with narrow, elongate squamae and short robust squamae. Beneath thorax densely clothed with long brown pile except for sparsely squamose inflexed pronotum; abdominal segments densely squamose on apical third, basal two-thirds sparsely squamose and hairy; legs sparsely squamose and hairy, anterior tibiae feebly bidentate at extreme tip. Length 18.7 mm., width 9 mm.

Holotype male in the author's collection, taken at Tube City, Arizona, July 3, 1937 by Mr. R. P. Allen, after whom the author gratefully names the species.

Polyphylla alleni was previously referred to by the author[1] as *opposita* Csy., but since studying Casey's types it has become apparent that it represents a species distinct from *opposita*. *P. alleni* is superficially most closely related to *sobrina* Csy. but it can be readily separated by its small size, narrow shape, and extremely small antennal club. The smallest male *sobrina* available has the antennal club one-third longer than in *alleni.* In both Fall's and Casey's keys *alleni* will key out with *opposita* but it can be readily distinguished by its smaller size, rufous color of abdomen, smaller antennal club and lack of hair on the elytra.

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[1] Cazier, Mont A. 1938, Pan. Pac. Ent. 14: 163.

Polyphylla decimlineata modulata Casey.

In most of the larger collections of *Polyphylla* taken from the San Joaquin and the Sacramento Valleys of California and various localities in Oregon there are numerous specimens of a small form that is generally associated with *decimlineata.* A close study of numerous specimens of this form has convinced the author that it represents at least a distinct subspecies of *decimlineata.* A recent study of the types seems to indicate that Casey described this variation from Oregon as *modulata.* Fall[2] places *modulata* as a synonym of *crinita* Lec. but it appears to the author that *modulata* is more linear and not nearly so robust as *crinita,* pile on pronotum not so long nor dense, vittae generally more narrowed and irregular and the size smaller. From *decimlineata* it is distinguished by its small size, narrow form, shorter antennal club which is about two-thirds as long as in *decimlineata,* and by the narrow vittae. It occurs with *decimlineata* in many localities but in a number of places has been taken in the absence of that species. The hair on the pronotum may or may not be present in this form and all gradations have been taken, however, when present it is not as dense as it is in most of the *crinita* specimens.

Attention is drawn to the new catalogue issued by the General Biological Supply House. This is really a great catalogue, not only in point of size, but in a high degree in the illustrations. There is in this a series of magnified photographs of minute life forms. These are really very fine and beautifully printed.—J. R. B.

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[2] Fall, H. C. 1928, Proc. Ent. Soc. Wash. 30: 34.

NEW FORMS AND SPECIES IN THE GENUS CATASTICTA—II (PIERIDAE: RHOPALOCERA).

By F. Martin Brown and A. G. Gabriel.

This paper describes material principally from the British Museum of Natural History. Mr. Gabriel is responsible for having recognized the forms and species as being unnamed. Mr. Brown has made the comparisons, written the descriptions and is responsible for errors.

Catasticta tatae, n. sp.

Males—Upperside: This is black-brown with a white discal band. The band is trapezoidal in shape. Its outer margin extends from the third median nervule just outside the cell to the inner margin at a point almost one quarter the distance in from the inner angle. It is not straight but scalloped. The inner margin of the band originates at a point almost equidistant from the subcostal, discocellular and median nervules and extends in a straight but slightly suffused line to the inner margin, meeting it about one-third of the distance out from the base. There is a limbal series of white spots between each pair of nervules except the fourth and fifth subcostal branches. A series of fine white dashes may or may not be present along the margin between the nervules. Two additional white spots are found just beyond the end of the cell between the radial and the subcostal and between the subcostal and its second branch.

On the hindwings the discal area is white and the limbal and extreme basal areas are black-brown. The basal area is heavily powdered with white scales and hair-scales. The dark limbal area extends to the end of the cell. The contact between this dark area and the white discal portion is suffused. Along this contact zone is a row of white internerval spots that are not distinct because of the suffusion. There may or may not be a series of white internerval marginal spots. The dark limbal band of these wings is much narrower than in *pitana* although both extend in to the end of the cell. (The third branch of the median nervule in *pitana* is 0.68 (0.66–0.71) times the length of the cell while in *tatae* it is only 0.51 (0.43–0.58).) The nervules are faintly lined with black-brown.

Underside: The forewings on this surface are marked precisely as on the upperside; the dark markings are, however, very dilute and the marginal series distinct.

The markings of the hindwings are divided into three zones similar to those on the upper surface but with the central white zone almost eliminated and indistinct. The white markings of the margin and limbal area are repeated in a dull yellow. There are rather broad indistinct lines between the nervules of the discal area, pale orange-ochre in color. In the basal area there are several dull yellow spots and two dull red spots one on each side of the attachment to the thorax. The dark color of the wings is intensified basad from each of the yellow markings in the limbal area especially as the anal angle is approached. The nervules are distinctly lined with black-brown.

Females—Upperside: This surface is much the same as is found on the same sex of *C. chiricana* Roeber. The white maculation on the forewings is reduced when compared with that species, but I have before me a specimen of *chiricana* that agrees with the allotype of *tatae* in this respect. The same is true of the hindwings.

Underside: Here the sexes compare favorably. Compared with *chiricana* it is duller and the yellow spots less distinct. The limbal area is more extensive than in the males of *tatae,* reaching the origins of the upper radial and first median nervules.

Average length of the costa of the forewing: 24.3 mm. (23–26).

Type localities and repositories of the types:

Holotype male, Alamor, Ecuador, September; American Museum of Natural History, New York City.

Allotype female, Quito, Ecuador; British Museum, London, England.

Paratype males 1 and 2, Sebollal, Ecuador, October; American Museum of Natural History, New York City.

Paratype male 3, Huigra, Western Ecuador, II.20.13, 2500 feet; British Museum, London, England.

Paratype males 4 and 5, Cauca, Colombia, winter 1897–1898; British Museum, London, England.

Paratype male 6, "New Granada" (*i.e.,* Colombia); British Museum, London, England.

This species is very close to *Sisamnus pitana* and may easily be confused with it. Whether it should be considered a full species or as a race of *chiricana* Roeber is difficult to decide. I have eight specimens before me and am inclined to consider it a full species.

A much longer series might show full intergradation to *chiricana.* The principal distinctions from *sisamnus* are the greater extent of the white on the upper side of the hindwings, the dull character of the markings on the under side of the same wings, and in the males the form of the wings; from *chiricana* the great restriction of white on the upperside of the hindwings on the males and the reduction of the white maculation on the upper surface of the forewings of the females.

The species has been named for the collector of the type, Mr. G. H. H. Tate of the American Museum of Natural History.

Catasticta reducta **butleria,** n. subsp. ✓

Males—Upperside: This surface is much like that of *reducta.* The basic light color is a little darker and the dark markings are more extensive. The limbal dark zone on the forewings is wider, about one-third the width of the wing. The limbal series is complete as is the inconspicuous marginal series of dashes. The basal dark area is suffused more strongly with scales of the light color. There is a light suffused streak along the median margin of the cell. The spots of the discal area are smaller and narrower because of the extension of the limbal zone and the dark streaks on the nervules.

The hindwings show the same increased marking on the nervules and folds across the discal area. Both limbal and marginal series are complete.

Underside: The forewings are like those of *reducta* with the discal area somewhat restricted.

The hindwings show the restriction to a greater degree. The limbal zone crosses the cell at the origins of the upper radial and first median nervules. The basal area extends beyond the origin of the subcostal. This leaves an extremely narrow light discal band obscurely crossed by yellow stripes between the nervules. It is wider anterior to the cell. The costal-precostal area is dark. The basal, limbal, discocellular and marginal spots are small. There are dark patches on the brown limbal area basad of all the yellow spots in that area. The pearly submarginal series is reduced to occasional scales in each interspace. Only the posterior red basal spot is evident.

Females—Upperside: The maculation of the sexes is the same. The basic light color of the forewings in this sex is white tinged with yellow toward the inner margin; of the hindwings it is lemon yellow.

Underside: This surface with one exception is identical with that of the males. The basic light color of the forewings is white and not dilute orange yellow as in the males.

Average length of the costa of the forewing: 24 mm.

Type locality: West slope of Andes, Northern Perú.

Repository of the types: Holotype male and allotype female, British Museum, London, England.

Catasticta grossana, n. sp. c ✓

Upperside: These surfaces show some similarity to *reducta* forms and *susiana*. The contour of the wings is intermediate, as is the pattern. The basic light color is white, the pattern is a rich dark brown. On the forewings the limbal zone covers fully the outer third of the wings. The limbal series is complete and is made up of small spots. The marginal series of dashes is evident only in the apical region. The basal dark area extends as far as the origin of the first median branch and fills the cell except for a small patch at the end. The discal area is crossed by broad dark lines on the nervules. The discal band is thus intermediate in appearance to *reducta* and *susiana*.

On the hindwings the limbal band cuts across the cell inside of the origins of the lower radial and second median nervules. Its inner margin is rather sharply defined as in *susiana,* but curved as in *reducta*. The basal area is rather clearly defined and again intermediate to the two species just mentioned. The nervules across the discal area are marked with dark scales as heavily as in *reducta*. The limbal and marginal series are complete and made up of small spots.

Underside: Here the alliance of this species to the *reducta*-group is clear. The forewings resemble those of *reducta* with a reduced discal band and somewhat reduced markings in the limbal area.

The hindwings are intermediate between *reducta* and its race *butleria* in all respects: width of the limbal and discal bands, the pearly submarginal series and the prominence of the yellow internerval markings. They show the group character of a dark costal-precostal area.

Length of the costa of the forewing: 25 mm.

Type Locality: "Colombia."

Repository of the type: British Museum, London, England.

Catasticta chelidonis form **germainia,** n. form.

Upperside: This is a suffused form of the stem-species. The light basic color is not so bright as on the type, but is well within the range of normal specimens. The limbal series is obsolete except for the anal spot on the hindwings which is abnormally large and suffuse. The nervules are a little more heavily marked than in typical *chelidonis*.

Underside: This surface is like that of *chelidonis* with the pearly submarginal markings greatly reduced. The reduction has been brought about principally by the extension of the dark marginings of the marginal series.

Length of the costa of the forewing:

Type locality: Cochabama, Yungas del Espíritu Santo, Bolivia.

Repository of the type: British Museum, London, England.

The form is named for P. Germain who collected the specimen for Dr. Rene Oberthür.

Catasticta discalba, n. sp.

Male—Upperside: This species is very easily recognized. The basic light color is white, the dark pattern color is dark brown. On the forewing the dark limbal zone covers a little more than one-third of the wing. The inner margin of the band has a distinct jog in it between the third branch of the median and the lower radial nervules. The limbal series is complete, but obscure throughout. The marginal series is lacking or present as mere traces of internerval dashes. The basal dark area is extensive and fills the entire cell. The light discal band is narrow and tapers from the inner margin toward the costa. It is crossed by broad lines of dark scales especially toward the base. The ante-discocellular series consist of three well separated spots. Except that the outer margin is less sharply indented this wing is reminiscent of *C. susiana*.

The hindwing has a broad dark limbal band that crosses the cell at the origins of the lower radial and median-two nervules. It narrows slightly toward the inner margin. The limbal and marginal series are obsolete or absent. The dark basal area is moderately extensive, crossing the cell at the origin of the subcosta and about halfway from the base to the origin of the first branch of the median nervule. The light discal area is broad and conspicuously free from dark scales, the usual lines of dark scales on the nervules are very narrow. This wing resembles *C. chelidonis* in pattern, but not color.

Underside: On this surface the forewing is in general typical of the *susiana*-group. There is only a small patch of white scales in the end of the cell.

The hindwing resembles to some extent that of *C. chelidonis.* The dark limbal area is about as extensive as on the upper surface. The marginal series is made up of rather large, moderately acute, yellow, straight sided triangles that are broadly outlined with rich brown scales. The apices of these brown margins touch the rather large yellow limbal spots. The areas between are filled with pearly scales. The inner portion of the dilute dark brown part of the limbal band shows the usual increase in intensity basad of each yellow limbal spot. The basal dark patch is a little more extensive on this surface than on the upper. There is a series of small yellow spots and dashes in this dark area. The costal-precostal area is yellow. The white or pearly scales of the discal band are almost eliminated by the great extension of the broad sulphur yellow internerval streaks. The posterior red basal patch is small, the anterior apparently lacking.

Length of the costa of the forewing: 28 mm.

Type localities: Loja and San Francisco, Ecuador.

Repository of the types:

Holotype male: Loja, Ecuador; British Museum, London, England.

Paratype male: San Francisco, Ecuador; British Museum.

Catasticta philomene philomene form **naranja,** n. form.

Male—Upperside: the maculation in this form is as in *philomene,* however, the basic light color is vivid orange and not yellow.

Underside: On this surface the form differs from the stemform in that the discal area of the forewing is rusty yellow, the limbal band of the hindwings wider and therefore the discal area reduced and all of the spots and streaks on the hindwing that are normally yellow are bright orange.

Average length of the costa of the forewing: 27 mm.

Type localities:

Holotype male; N. E. Sorata, Bolivia.

Paratype male; Apolobamba, Bolivia.

Both are in the Godman and Salvin Collection of the British Museum, London, England.

Catasticta smithia, n. sp.

Male—Upperside: A clear cut black and white pattern with the dark color predominant. On the forewings the dark limbal band covers the outer third of the wing. The limbal series is complete and made up of small spots. The marginal series of white dashes is conspicuous in the apical region only. The dark basal area fills the cell and extends almost to the mid-point of the inner margin. The light discal band is somewhat suffused with black scales and broken into blocks by the heavily marked nervules.

On the hindwings the limbal band is broad, almost reaching the origins of the upper radial and the first branch of the median nervules. The dark basal area extends to the origin of the subcostal nervule. The narrow light discal band is suffused as on the forewing and crossed by dark lines on the nervules. These lines of dark scales are not so broad as on the forewing. The limbal series is made up of crescentic patches with the horns outward and is placed on the outer half of the band. The marginal series is complete and made up of suffused triangular patches in the interspaces.

Underside: This form differs from *distincta* on these surfaces in only one respect: the discal light zone of the forewings is reduced and barely enters the cell at its extremity.

Length of the costa of the forewing: ?

Type locality: "Peru."

Repository of the type: British Museum, London, England.

The insect described may be an aberrant *distincta*. Whether it is or deserves full specific standing will depend upon further material.

Catasticta frontina, n. sp.

This species may be a highly modified form of *suasa*. It is quite variable, but the maculation of the underside of the hindwings is characteristic.

Upperside: The basic light color on these surfaces is much obscured by overscaling of the dark pattern color and varies from almost white to distinctly yellow. The dark pattern color is a rich brown. The marginal series on the forewing is restricted to a few dashes in the apical region. The dark limbal zone extends two-thirds of the distance to the end of the cell. The limbal series of small rounded suffuse spots is nearer to the inner margin of the band than to the margin of the wing. The dark basal area covers about one-third of the wing and fills the cell except for the extreme outer end. The nervules are all rather broadly lined with dark scales. The broken discal band is dulled with an overlay of dark scales.

The hindwings are in character with the forewings. The marginal series is complete, but obscure. The dark limbal series is nearer the cell than to the margin of the wing and is made up of suffuse acute marks of moderate size. The dark basal area is practically absent. The nervules and folds are lined with dark scales. The discal band is uniformly overlaid with dark scales.

Underside: The forewings are marked as on the upper side with the usual modifications. The marginal series is complete and made up of linear triangular patches; those in the apex are rather broader across the base. The yellow-buff limbal series of spots are lunulate, encircling the ends of the marginal series. The buff discal band is free of suffusion. The basal area is slightly overlaid with light scales and a light line extended from the base along the mid-line of the cell to about the middle of the cell. There are light lines along the subcostal and radial nervules at the base.

On the hindwings the dark limbal area almost reaches the origins of the M_1 and Cu_2 nervules. The marginal series is made up of large acute yellow triangles, the bases almost contiguous. These are broadly margined with dark brown, darkest against the yellow. The submarginal pearly markings are reduced to a pair of oblique dashes paralleling each of the marginal series spots just beyond their apices. The limbal yellow series is nearer the cell than the margin of the wing and has dark basal extensions from each spot. Two small yellow spots straddle the lower discocellular nervule. The dark basal area extends just beyond the origin of the R_s in the cell. The pearly discal band is slightly wider outside the cell. It is crossed by moderately broad yellow streaks which are brokenly extended into the dark basal area. The nervules and folds are dark lined. The basal red spots are both present.

Length of the costal margin of the forewing: 28 mm.

Type: a male, Frontino, Antioquía, Colombia, in British Museum.
Paratypes: all males.
one, "Interior of Colombia," British Museum.

one, Gualaquiza, Ecuador, in British Museum.
one, Loja, Ecuador, in British Museum.
one, Cosnipata Valley, Peru, in British Museum.
one, No datum, Maasen Coll. Zoological Museum, University of Berlin, Germany.

Catasticta philoscia form **ferra,** n. form. ✓

Upperside: This form differs from typical *philoscia* in the basic light color. On *philoscia* it is white or pale yellow; on this form light rusty red. The pattern of dark colored scales is the same for both forms.

Underside: The maculation is the same as that found on form *philothea.* The basic color of the forewings is orange and the yellow markings on both wings a little richer than on *philothea.*

Average length of the costal margin of the forewing: 26 mm.

Type: a male, Ambato, Ecuador, in the British Museum.

Paratypes: three males with same data as the type in the British Museum.

A male, Ecuador, in the British Museum.

Catasticta giga, n. sp. ✓

Upperside: This surface has a basic light color of pale ochre. The maculation of the forewings is like that on *troezene.* The hindwings are patterned like *seitzi,* but are shaped more like *troezene.* The outstanding character of the surface is the uniform dark overscaling in the discal areas. The inner portion of the limbal band on the hindwings reaches the Cu_2 nervule. The marginal spots of the hindwing are moderately large and rather clear throughout.

Underside: Here this curious species resembles most closely *affinis* in all respects but two. There is a large streak of ochre scales along the middle of the cell of the forewing and the dark margins of the triangular marginal series of spots on the hindwings are narrow.

Average length of costal margin of forewings: 28 mm.

Type: a male, Frontino, Antioquía, Colombia, in the British Museum.

Paratypes: two males same data in the British Museum.

Catasticta gelba, n. sp. ✓

Males—Upperside: The light basic color is ochre-yellow, the pattern color black-brown. The forewings are marked like *troezene,* but the light discal area is a little more prominent.

The hindwings are intermediate to *troezene* and *affinis* in maculation. The limbal dark band extends to the origin of the M_2 and M_3 nervules. The spots of the marginal series are small and only those in the anal region are clear. The spots of the limbal series are large and suffuse.

Underside: The forewings are a repetition of the upperside with the discal area free of overscaling and the limbal and marginal series of spots larger. The marginal series is composed of short yellow wedges. There are some pearly white patches in the apex between the two series of spots. The hindwings resemble *zancle* but are more intensely marked. The dark margins of the triangles composing the marginal series are broad and somewhat reduce the pearly submarginal band. The dark inner portion of the limbal band is about one-third the total width of the band. The dark basal area reaches the origin of the R_s.

Female—Upperside: This is similar to that of the males, but much lighter, the forewing having a whitish-yellow and the hindwing a pale lemon-yellow basic color. The limbal and marginal series of both wings are obsolescent.

Underside: Again similar to the males, but with a much narrower margin of brown on the marginal series of spots on the hindwing.

This sex differs from the same sex of *zancle* in the greater width of the limbal band on the upperside and the absence of the marginal and limbal series.

Length of the costal margin of the forewing: 25 mm.

Types: Holotype male, Mérida, Venezuela, in British Museum. Allotype female and one paratype male "Venezuela" in British Museum.

Catasticta rileya.

Upperside: This surface resembles that on *philoscia* f. *philothea* Felder. It is on the underside that the affinity with the *uricoecheae* group is seen. The basic light color, dilute orange-yellow, is totally obscured by heavy overscaling of rich black-brown pattern color. The limbal band is about a third the width of the wing and is decorated with a complete limbal series of sagittal marks nearer the inner margin than to the margin of the wing. A complete series of marginal dashes is present. The basal dark area is almost entirely confined to the costal portion of the cell. The broad overscaled discal band is crossed by heavy lines of dark scales on the nervules.

The hindwings are marked similarly. The limbal band just falls short of the cell. The limbal series is large and the spots only separated by the dark lines on the nervules. The marginal series is composed of small light triangles. The dark basal area is absent.

Underside: The forewings are bright orange patterned with warm brown, yellow, and white. The limbal band is of the same width as on the upperside. The limbal series is contiguous, the anterior spots are white and the posterior ones orange. The marginal series of slender wedges is yellow. The greater portion of the cell is orange. The basal dark area extends to a point beyond the origin of the Cu_2 nervule.

The hindwings are interesting. The limbal dark area is broken into three distinct bands: A marginal band of rich chocolate brown marked with a marginal series of triangular spots with deeply incurved sides; a pearly submarginal band about the same width crossed by narrowly lined nervules and the streak of the limbal series; and a dark inner portion occupying more than half of the entire width of the limbal band in which the limbal series of yellow streaks originate and marked basad of each streak with darker brown. The narrow discal band of glistening white is crossed by the usual yellow streaks and the dark lines on the nervules. The basal dark area extends to just beyond the R_s nervule and is marked with broken extensions of the discal yellow streaks. The basal spots are dull red and minute.

Average length of the costal margin of the forewing: 25 mm.

Type and paratype: 2 males, Chachapoyas, Amazonas, Perú, in the British Museum.

Paratype, a male, near Rioja, San Martín, 900 m., XI.9.36. Coll. F. M. Brown.

Catasticta rileya form **tamsa** n. form.

Upperside: This form differs from the typical in being grayer.

Underside: Generally lighter than the typical form. The submarginal pearly band on the hindwings is narrower and the white does not extend so far toward the inner margin on the limbal series of the forewing.

Type: a male Utcuyaco, Perú, 4800 feet, in the British Museum.

Paratypes: a male Chanchamayo, Perú; a male Río Tabaconas, 6000 feet, Perú; both in the British Museum.

The three specimens of *tamsa* vary somewhat in the extent of the inner margin of the limbal band on the upperside of the hindwings. The type is intermediate to the paratypes in this respect and is not like *rileya.*

Glyptoscelimorpha viridis Chamberlin (Coleoptera—Buprestidae).—This small buprestid beetle is very uncommon in collections and very little is known about its distribution or habits at the present time. It seems worthy to record the capture of this rarity some two hundred miles from its previously known range. As far as known, the only previous records have been from the vicinity of Palmdale, Los Angeles Co., California. While looking over some material collected by Dr. R. H. Beamer, of the University of Kansas, in southern California the author came across five specimens that were collected on Juniper at Mt. Springs filling station about seven miles east of Jacumba, San Diego Co., Calif., July 25, 1938. This would indicate that the species is rather widely distributed in southern California and probably follows the distribution of the Junipers along the foothills. Perhaps a seasonal peculiarity accounts for its relative scarcity in collections.—Mont A. Cazier, Berkeley, Calif.

Two New United States Records of Heteroptera.—The most striking of these records is the cydnid *Syllobus emarginatus* Stål, a Mexican species heretofore not known from north of the border, of which I have one specimen labelled "Fla."

The other is the record of *Podops peninsularis* Blatchley from White Plains, N. Y., April 21, 1912. This is the specimen determined by me as *parvulus* Van Duzee, and so recorded in the New York State List.—J. R. de la Torre-Bueno, Tucson, Ariz.

NEW SPECIES OF AMARA FROM WASHINGTON.

By G. Minsk and Melville H. Hatch,
University of Washington.

Subgenus *Acrodon* Zimm.

Amara (Acrodon) exlineae Minsk and Hatch n. sp.

General form oblong, parallel; color piceous brown, shining, the legs and antennae paler; antennae as long as head and thorax, not carinate; head at base narrower than pronotum at apex; pronotum about six-sevenths as long as wide, widest just behind the middle, the apex from nearly two-thirds to about seven-tenths as wide as the base, the sides broadly arcuate in front, behind oblique or feebly arcuate to the slightly obtuse hind angles, the median impressed line distinct, entire, the inner and outer foveae distinct but often obscured by the variable punctation of the region of the hind angle; elytra at extreme base not wider than pronotum, behind wider, widest just behind middle, the striae very finely punctulate; scutellar striae distinct and terminating in an ocellate puncture at base, the posterior end free or attached; mental tooth entire, usually rounded, rarely acute or feebly sinuato-truncate at tip; prosternal lobe margined, the tip rounded; ventral surface of body smooth, shining.

Male with the three basal protarsal segments dilated, much larger than the fourth segment, with large scales beneath, the last abdominal segment with one seta on either side along the apical border; female with the three basal protarsal segments not dilated, only slightly and gradually larger than the fourth segment, without scales beneath, the last abdominal segment with setae on either side along the apical border. Length 5–6.5 mm.

Type male, allotype female, and 46 paratypes: Mt. Rainier, Wash., Paradise Park, August 12, 1933, M. H. Hatch. 138 paratypes same data variously dated: July 7, 8, 1928; August 8–10, 24, 1930; August 13, 1933; August 20, 21, 1934; July 17, 18, 1935. 12 paratypes same data, Sluiskin Falls, July 29, 1932; August 23, 1930. 10 paratypes, same data, Sunrise Park, July 25–26, 1931. These specimens were taken under stones mostly in the open "parks" above the 5,500 foot level. We take pleasure in naming this species after our mutual friend and colleague, Dr. Harriet Exline.

Of 24 specimens taken on July 7–8, 1928, only one was a female.

Throughout most of the season the two sexes are equally represented, but by August 23–24, there were 30 females to 14 males.

This species is distinguished from *Amara* (*Acrodon*) *brunnea* Gyll. by the fact that the scutellar stria arises from an ocellate puncture, and by the usually somewhat more finely punctulate elytral striae. This makes *exlineae* somewhat similar to *Amara indivisa* Putz., known apparently from no more than a pair of specimens[1] from the vicinity of Diest, Belgium. It is distinguished from *brunnea*, according to Ganglbauer (Kaf. Mitteleur. I, 1892, p. 325), by the ocellate puncture at the base of the scutellar stria, its broader body form, its more prominent eyes, its thicker antennae, the pronotum with the sides behind almost straight, the anterior angles less prominent, the posterior angles rectangular, the basal foveae deep. In most of these respects *indivisa* seems to approach *exlineae*, and the latter is retained as distinct largely on the basis of the extreme improbability that a localized alpine form from the American northwest can be identical with a species from the lowland of western Europe.

Subgenus **Pseudotriaena** Minsk and Hatch subg. nov.

This subgenus in common with *Zezea* Csiki (*Triaena* LeC.) is distinguished from the other subgenera of *Amara* by the trifid apical spur of the protibia. It is distinguished from *Zezea* by the absence in the male of a densely pubescent area on the apical portion of the inner surface of the metatibia. It thus bears somewhat the same relationship to *Zezea* as the subgenus *Celia* Zimm. does to the subgenus *Amara* s. str.

> General from oblong, parallel; color more or less metallic piceous, legs rufous, three basal antennal segments testaceous; antennae extending beyond middle of pronotum, the second and third segments finely carinate; head at base narrower than pronotum at apex; protonum and elytra finely alutaceous; pronotum with apex about three-fifths as wide as base, the length about seven-tenths that of the width, which is greatest just before the base, the sides arcuate, more strongly so in front, the hind angles subrectangular to narrowly rounded, the median line distinct but not entire, inner and outer foveae distinct, variably punctate; elytra at base as wide as pronotum at apex, the striae obscurely punctulate; mentum tooth emarginate; prosternal lobe margined, rounded at tip; male with three basal protarsal segments dilated, much larger than the fourth

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[1] Everts, Col. Neerl. I, 1903, p. 81.

segment, with scales beneath; last abdominal segment of male with one seta on either side along apical border.

Subgenotype: **Amara (Pseudotriaena) glabrata** Minsk and Hatch n. sp.

The three species of this new subgenus may be distinguished as follows:

1. Scutellar stria terminating in an ocellate puncture at base.
    2. Hind angles of pronotum in the region of the foveae scarcely punctate; color above shining black with obscure metallic tinge; metepisternum scarcely punctate; length 6.5–7.4 mm.; type male: Seattle, Wash., VII–1928; paratype male: Manchester, Wash., V–27–1934.
    glabrata Minsk and Hatch n. sp.
    2′. Hind angles of pronotum in the region of the foveae strongly punctate; color above aeneous, shining; metepisternum strongly punctate; length 7 mm.; type male: Seattle, Wash., VII–9–1935. *W. White.*
    alaxnoguia Minsk and Hatch n. sp.

1′. Scutellar stria not terminating in an ocellate puncture: hind angles of pronotum in the region of the foveae sparsely punctate; color above aeneous, shining; metepisternum sparsely punctate; length 6.5–7.4 mm.; type male: Seattle, Wash., IV–30–12; paratype male: Salt Lake, Utah.
atrichata Minsk and Hatch n. sp.

Amara (Zezea) kincaidi Minsk and Hatch n. sp.

Black, shining, with the appendages except the eight distal segments of the antennae rufotestaceous, the femora somewhat darker, dorsum impunctate except for a few fine punctures towards the hind angles of the pronotum, finely microreticulate; head through eyes narrower than pronotum at apex; antennae extending behind the middle of the pronotum, the second and third segments carinate; pronotum with the apex about seven-tenths as wide as the base, the length about seven-tenths that of the width, as wide at apex as at base, 85% as long as wide, the width greatest at or just behind the middle behind which the sides are oblique to the hind angles which are right; the sides in front of the middle broadly arcuate to the rounded front angles: base of pronotum sinuate on either side towards the hind angles, the basal impression double, setiferous puncture of hind angle equidistant from side and base, the middle line continuous, attaining neither base nor apex; elytra with eight impressed punctulate striae, a short scutellar stria between the first and second striae with an ocellate puncture at its base; elytra at base subequal in width to pronotum at middle; elytra 6/7 as wide at base as at widest portion which is behind the middle; inner lobe of protibial apical spur rounded; venter black, shining, subimpunctate; male with three basal protarsal segments dilated, much larger than fourth segment, with large scales beneath, the metatibia with pubescence on inner side towards apex, the last abdominal segment with two seta on either side along the apical border; female with protarsal segments unmodified, the last abdominal segment with two setae on either side along the apical border; length male 6.5–7 mm.; female 7–7.5 mm.

Type male: Renton, Wash., 5–31–13. Allotype and paratype females: Centralia, Wash., 4–IV–12. Paratype males: Evans Cr., Wash., X–28–1928, and Seattle, Wash., IV–27–1932, P. L. Peterson. Paratype female: King Co., Wash., Evans Creek, August 30, 1929, M. H. Hatch.

Distinguished from all other Nearctic species of *Triaena* with an ocellate puncture at the base of the scutellar stria by the fact that the pronotum is distinctly wider at the middle than at the base, the sides behind the middle oblique.

We are pleased to name this species for Professor Trevor Kincaid, who collected the type.

The type material mentioned in this paper is in the collection of Melville H. Hatch at the University of Washington.

DISTRIBUTIONAL NOTES ON BEMBICIDAE (HYMENOPTERA).

By George Steyskal, Detroit, Mich.

It is believed that the following notes on Bembicid wasps in the University of Michigan Museum of Zoology add information of value in the study of a group of insects well suited to zoogeographical study.

Bembix nubilipennis Cresson. Anderson's Ranch, Washington, Co., Utah, 12 June 1919; St. George, Utah, 26 May 1919.

B. primaaestate Jns. and Rohw. Lamar and Walsenberg, Colo.; Winnfield, La.

B. pruinosa Fox. Cedar Point, Ohio, 11 July 1916; Berrien Co., Mich., 5 Aug. 1917; Detroit, Mich., 3 and 5 Sept., 1938.

B. sayi Cresson. Male, Antelope Hills, Roger Mills Co., Okla., 25

June 1926; male, Walsenberg, Huerfano Co., Colo., 5 Aug. 1925; male and female, Monte Vista, Colo., 20 Aug. 1925.

B. spinolae Lep. Huron, Charlevoix, Alger, Washtenaw, Livingston, Otsego, Montmorency and Berrien Cos., Mich.; Walsenberg, Colo.; White Sulfur Springs, Ga.; Cedar Point, Ohio; Valley City and Devil's Lake, N. D.

B. troglodytes Handl. Females, Phantom Lake, Fort Davis quadrangle, Davis Mts., Texas, 9 June 1916; male, Glenn Spring, Brewster Co., Texas, 3 July 1928.

Bicyrtes annulata Parker. Glenn Spring, Brewster Co., Texas, 16 June to 3 July 1928.

B. fodiens Handl. Gainesville, Fla., 19 July 1925.

B. quadrifasciata Say. Sand Point, Huron Co., Mich., 13 Sept. 1927; Ann Arbor, Mich., 25 July 1927; Rock Bluff Landing, Liberty Co., Fla., 1 June 1924; Van Buren, Mo., 12 June 1930.

B. variegata Oliv. Female, Glenn Spring, Brewster Co., Texas, 26 June 1928 (F. M. Gaige). Not heretofore recorded from the United States.

B. ventralis Say. Huron, Washtenaw, Cheboygan, Dickinson, Berrien, Alger, Wayne, Oakland, Charlevoix and Montmorency Cos., Mich.; Macon, Ga.; Winnfield, La.; Ithaca, N. Y.; Allardt, Tenn.

B. viduata Handl. Juniper Canyon, Chisos Mts., Texas, 19 July 1928; Glenn Spring, Brewster Co., Texas, 18 and 30 June 1928.

Microbembex aurata Parker. Male, Glenn Spring, Brewster Co., Texas, 3 July 1928 (F. M. Gaige). Recorded previously only from California and Arizona (type series).

M. monodonta Say. Huron, Washtenaw and Alger Cos., Mich.; Anderson's Ranch, Washington Co., Utah; Hurricane, Utah; Cedar Point, Ohio; Maloa farm, Agaun River valley, Honduras.

Steniola duplicata Prov. Glenn Spring, Brewster Co., Texas, 3 July 1928.

S. obliqua Cresson. Gunnison, Colo., 4 Sept. 1929.

Stictiella tenuicornis Fox. Glenn Spring, Brewster Co., Texas, 16 June to 3 July, 1928.

NOTES ON MY MONOGRAPH OF ODONTOMYIA[1] (DIPTERA, STRATIOMYIDAE).

By Maurice T. James, Colorado State College, Ft. Collins, Colo.

A study of the Loew types of *Odontomyia* in the Museum of Comparative Zoology has made necessary several corrections to my monograph of that genus.

O. nigerrima was misdetermined. The species given that name on page 533 was really undescribed. I therefore propose the name **Odontomyia melantera**, n. sp.

Synonym, *O. nigerrima* James, 1936; not Loew, 1872. Holotype, ♂, Ottawa, Canada, June 3, 1914 (J. I. Beaulne); allotype, ♀, Jordan, Ont., June 6, 1919 (W. A. Ross); paratypes, ♂, ♀, Pt. Pelee, Ont., June 12, 1925 (Walley).

Steyskal[2] described a related form, *O. profuscata,* which differs chiefly in having the legs wholly yellow and the abdomen more conspicuously marked with yellow.

O. nigerrima Loew runs to *interrupta* in my key; but the tibiae, except base and apex, are black, the facial keel is sharper and more prominent, and the yellow abdominal markings are narrower.

O. plebeja Loew (not *plebia*) is a valid species close to *virgo;* specimens are larger and have the antennae wholly yellow and the black band on the abdomen narrower.

Odontomyia confusa James = *O. inaequalis* Loew; *O. inaequalis* of my monograph (p. 544) represents an undescribed species which I am naming

Odontomyia communis, n. sp.

Synonym, *O. inaequalis* James, 1936, not Loew, 1865. Holotype, ♀, allotype, ♂, Fort Collins, Colo., July 11, 1937 (James); paratypes 9 ♂, 17 ♀, Fort Collins, July 9 & 11, 1937 (James) and Aug. 13, 1937 (M. & H. James); 1 ♂, Brighton, Colo., July 8, 1935 (Jones); 1 ♀, Trinidad, Colo., July 13, 1899; 1 ♂, Windsor, Colo., Aug. 19, 1898; 1 ♂, Rocky Ford, Colo., July 8, 1899; 1 ♂, Joes, Colo., July 12, 1931; 1 ♀, Loveland, Colo., Aug. 20, 1912; 3 ♀, Fort Collins, Colo., Aug. 10, 1899 and Aug. 3, 1931; 1 ♀, Ft. Lupton, Colo., Aug. 20; 1 ♀, Boulder, Colo., July 27, 1933 (C. H. Hicks); 1 ♂, Boulder, Colo., July 10, 1932 (James); 1 ♀, Greeley, Colo., July 19, 1938 (James).

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[1] James, Maurice T., 1936, Ann. Ent. Soc. Amer, 29: 517–550.

[2] Steykal, George C., 1938, Occ. Pap. Mus. Zool. Univ. Mich., 386, p. 3.

A NEW CALIFORNIA TIGER BEETLE (COLEOPTERA—CICINDELIDAE).

By Richard G. Dahl, Oakland, California.

The author would like to express his appreciation and thanks to Mont A. Cazier, whose helpful suggestions and loan of material from his collection have made possible this description. Thanks are also due to those mentioned as contributing specimens.

Cicindela willistoni amargosae Dahl subsp. nov.

> Medium sized, dull, sericeous, blue-green, sparsely hairy above, rather densely hairy beneath; elytral maculation consisting only of small apical spot. Male.—Head with eyes wider than pronotum, front sparsely pilose, interocular longitudinal striae prominent, clypeus bare, labrum short with small acute median tooth, white, narrowly margined with black; maxillary palpi, blue-green, sparsely pilose; mandibles tridentate, blue-green with white base, tips shining purple; antennae green, first segment with eight prominent white setae; second, third and fourth segments sparsely pilose. Thorax sparsely pilose along sides, wider than long, widest at apical fourth, side margins narrowly constricted at base, basal and apical impressions deep, median longitudinal impression prominent, disk shallowly rugose; color, uniformly brilliant sericeous blue-green, impressions dark blue-green. Elytra glabrous, sides gradually widening to apical third, evenly rounded to apex, apical margins unserrated, subsutural row of foveae distinct, turning outward apically and joining with a row of distinct marginal foveae; surface uniformly punctate throughout, punctures separated by approximately twice their own widths, basal punctures slightly deeper than apical punctures; color uniformly sericeous blue-green, impressions dark blue-green to purplish, maculation consisting only of small apical spot. Beneath rather densely clothed with long, erect, white pile; color of entire underparts uniformly bluish-green; legs blue-green, rather densely clothed with erect, white pile; front coxae and femora more densely pilose than rest of surface, trochanters of front and middle legs with single posterior setae. Length 11.9 mm., width 5.2 mm. Female.—Same as male, except for slightly larger size. Length 12.2 mm., width 5.2 mm.

Holotype male, allotype female in the author's collection, collected four miles north of Furnace Creek, Death Valley, Inyo

County, California, April 3, 1939, by the author. All specimens were taken along the margins of saline pools in the Amargosa River drainage basin. Forty-one male, and fifty female designated topotypical paratypes collected by K. S. Hagen, W. F. Barr, L. L. Jensen, and the author deposited as follows; K. S. Hagen, eight; W. F. Barr, four; L. L. Jensen, fifteen; California Academy of Sciences, two; Dr. Walther Horn, two; Mont A. Cazier, four, and fifty-six in the author's collection.

This subspecies is most closely related to *Cicindela willistoni* Lec. and its subspecies *pseudosenilis* W. Horn, *echo* Csy., and *spaldingi* Csy., as given by Cazier,[1] being probably most closely related to *pseudosenilis. Cicindela willistoni amargosae* can be readily separated from any of the above forms by its sericeous blue-green color, reduced maculation which consist only of the apical spot; by the elytral punctation and the almost universal lack of the cupreus tinge on the pronotum. In C. *willistoni, pseudosenilis, echo,* and *spaldingi* the elytral punctures are separated by less than their own widths and the interspaces are rugose. These rugosities obscure the punctures and cause the appearance to be dull. In *amargosae* the elytral punctures are separated by about twice their own widths and the interspaces lack these rugosities and are sericeous.

The series before me shows little in variation except, in the color and maculations. Some specimens are bluish and vary to rather brilliant cupreus green. In a small number of specimens a small isolated ante-apical spot is faintly indicated. Two female specimens show a faint small spot representing a portion of the transverse arm of the middle band. The largest female is 13.0 mm. long and 6.6 mm. wide, the smallest male is 10.2 mm. long and 4.2 mm. wide.

As far as is known the only locality for this subspecies is the salt flat near Furnace Creek, Death Valley, California. Specimens of *Cicindela willistoni pseudosenilis,* were taken at the same locality but none were exact intermediates between *pseudosenilis* and *amargosae.* The specimens of *amargosae* with a portion of the middle band show a gradation in the markings but are distinct in the punctation and color. Several specimens of *pseudosenilis* show a narrowing of the elytral markings; but no reduction, other than this narrowing, has been seen. Future collections may produce specimens more intermediate between the two forms than those now available. Certainly the occurrence of so large a population of this relatively constant aberrant form in this one locality, justifies its subspecific status.

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[1] Cazier, 1936; Bull. So. Cal. Acad. Sci.; 35: 157–159.

ON FOOT NOTES, GLOSSES, OBITER DICTA AND ASIDES.

All entomologists do it, even as you and I. Not one of us but what, at one time or another, in the course of comment, has inserted an important statement extraneous to the limited subject under discussion. This unfortunate practice leads to many mistakes of fact and interpretation.

Such facts, for example, as the occurrence of Neotropical forms in our Southern border States, are inserted casually in some taxonomic discussion of another group. It might seem that such cases should have a separate and emphasized treatment, otherwise, they are overlooked or lost.

Naturally, the writer's formal acquaintance with these facts refers to hemipterology. But his editorial work has shown him that such things are done in other groups.

Why mention in a commentary on Coleoptera that a given generic name is preoccupied in Hemiptera? What hemipterist is going to critically examine a paper on Coleoptera? Why, in a taxonomic and ecological discussion on a given group, state that a particular food plant harbors a diversity of other forms? Who would think of looking for food-plants of Chrysomelidae in an article on Hemiptera? Such things should be given a separate emphasized mention or they are lost.

Why extensively discuss teratology in a taxonomic article on a certain genus, because a synonym was erected on an imperfect specimen? Who would think of looking for such a distinct matter therein?

Why insert a question as to specific validities in an otherwise bare faunal list? Such an item demands separate and more or less formal and documented individual treatment.

Why put in as a footnote a remark or statement which is integral to the matter discussed and to its proper understanding?—J. R. T.-B.

Second Notice to Authors.—The numerous long papers on hand will delay the publication of the latest received. We cannot guarantee prompt publication of papers over 6 typewritten pages, double spaced.—Editor.

PROCEEDINGS OF THE SOCIETY.

MEETING OF APRIL 14, 1938.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, April 14, 1938. President William T. Davis presided, calling the meeting to order at 8: 15 P.M. Ten other members were present, namely, Dr. Dietrich and Dr. Tulloch, and Messrs. Buchholz, Dietz, Engelhardt, McElvare, Rau, Siepmann, Stecher and Wilford, also two visitors, Dr. A. Glenn Richards and Mr. Milton Lesser.

The minutes of the previous meeting were read and approved. Mr. Engelhardt presented a report of the treasurer.

Mr. Engelhardt exhibited a specimen of *Sphaeroderus* which he took in his garden at Hartsdale, N. Y., this spring.

Dr. A. Glenn Richards, Jr., was the speaker for the evening, addressing the society on the Noctuid moths of the *Melipotis-Syneda* group. There really isn't any genus called *Syneda* any more, and the species are distributed among a great many genera. *Melipotis* and *Syneda,* however, are the genera to which our local species were once assigned, and the names are still familiar to many entomologists.

The *Melipotis-Syneda* group is found in the Neotropical, Nearctic and Palearctic Zones. It is absent in the Ethiopian and Indo-Australian regions. The genera can be broken into four groups as follows:

I. *Phoberia* (4 species), *Cissusa* (*Ulosyneda*) (4 or 5 species), *Litocala* (1 species), and *Melipotis* (40 to 50 species).

II. *Forsebia* (1 species), *Drasteria* (50 species), *Leucanitis* (4 species), and *Anumeta* (about 10 species).

III. *Bulia* (*Cirrobolina*) (4 species).

IV. *Panula* (1 species).

It is noteworthy that most of the species should fall into two genera, while the remaining genera are either monotypic or of small size. The majority of the species belong in the first two groups. Most of the species of the first group belong to *Melipotis.* With the exception of *jucunda,* all of the species of *Melipotis* are fundamentally Neotropical, although ten species either extend or stray up northward into North America. Most of the species of the second group belong to the genus *Drasteria,* which is Holarctic in distribution.

In the Old World the species of the *Melipotis-Syneda* group are found from Algeria and Palestine eastward to Abyssinia, Turkestan and Southern Russia. With the exception of one species, all of the Old World species occur in desert regions, similar to our sage deserts. The New World species usually occur in similar regions, although one Eastern species, which is sometimes reported as a pest in blueberry fields, does not.

There is no one character which will delineate the *Melipotis-Syneda* group from the rest of the Noctuids. Wing venation is of no value as most of the lower Noctuids have the same venation. There are a few structural characters, but none of the kind you would want to use in a key. Other characters include the wing shape and the size of the cell of the hind wing. It is best, perhaps, to accept general habitus for separating the genera.

Hampson constructed what he admitted was an artificial key based upon the spines of the tibia. This key is very useful because it places the species where they can be located and identified. It has been shown, however, by studies of larvae, genitalia and general habitus, that this is not a very natural division.

These spines are very variable, but as a rule are constant in each species. In a common cutworm, *Sidemia devastatrix,* for example, there are ordinarily no spines on any of the legs. Yet, if you examine a large series you find some with one or two spines on one or more legs up to four spines on each leg. If you were to follow Hampson's key strictly, it would throw these specimens into different subfamilies.

There is also a correlation between the presence or absence of spines on the tibia and the relative length of the tibia. The tibia becomes shorter and broader while the tarsus tends to maintain the same size relative to the insect, as the spines become present or more pronounced. This is quite general throughout the Noctuidae. It is best expressed by comparing the length of the tibia to the length of the metatarsus. In species without spines the metatarsus is from 2/3 to 3/4 the length of the tibia. In certain European species with small spines, the metatarsus is about the same length as the tibia. In species with large spines, as *Drasteria,* the tibia is shorter than the metatarsus.

A continuous series of intermediate forms occurs, from unspined species having the corners of the tibiae rounded, to unspined species having the corners of the tibiae angulate, to species having spines so small that they are little more than an angulation, to species having spines of moderate or large size. There is no place where the series can be conveniently broken into genera.

The results, too, are obviously artificial. In habitus and even more in the structure of the genitalia, the species of the Old World with spines on the tibiae are more closely related to the species of the Old World without spines than to those of North America with spines. Not all the species in North America with spines on the tibia look alike. Some of the species with spines are not so closely related to each other as they are to others without spines.

Another interesting thing about this family is the tendency for some of the species to simulate, in their ground color, the color of the environment in which they live.

Dr. Richards illustrated his talk with specimens from various parts of the world.

The meeting adjourned at 10:00 P.M.

CARL GEO. SIEPMANN,
Secretary.

MEETING OF MAY 12, 1938.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum, on Thursday, May 12, 1938, with president William T. Davis in the chair and eleven others members present, namely, Messrs. Buchholz, Dietz, Engelhardt, Krombein, McElvare, Pechuman, Rau, Shoemaker and Stecher, Dr. Dietrich and Dr. Tulloch; also three visitors, Miss Dietz; Mr. Richard Lewis Post, and the Rev. Edward Guedet, of Napa, California.

In the absence of the Secretary, Dr. Tulloch acted as Secretary pro tem.

Mr. Engelhardt reported informally on the financial status of the Society.

Mr. Engelhardt exhibited a selection of the clearwing moths *Aegeria apiformis* and *tibialis* Harris. In the larval state both species are borers at the base or in the upper roots of poplars, aspen and willow, the first named an introduction from Europe, the second indigenous to North America, ranging across the continent. *Apiformis* has become well established and of economic importance along a narrow belt on the Atlantic Coast hardly exceeding 100 miles either south or north of New York City. Of *tibialis,* although described by Harris over a hundred years ago, very few examples have been collected in the New England States. Most of the examples in collections come from the Rocky Mountain regions, from British Columbia and the Pacific Coast. Throughout the range of the species there occur color variations indicative of climatic conditions in environment, darkening in moist, cool regions and brightening in arid, warm regions. Several of the variations have been given specific rank, but they should not be recognized other than as geographical races of one species. Examples of pupa, cocoon and larval work in an aspen were shown.

A female of the butterfly *Anthocharis genutia* Fab. was bred by Mr. Engelhardt, emerging on April 21. Larvae were noticed in May 1937 on rock mustard at Lincoln, N. J. They were transferred with food plant to Mr. Engelhardt's garden at Hartsdale, N. Y. and later to a cool basement where they pupated and wintered well. Success was also obtained with a chrysalid of the little blue butterfly *Phaedrotes piasus* Bdv. collected under a stone on Monarch Pass, Chaffee Co., Colorado, elevation 12,000 feet during July, 1937. Wintering in a cool basement, a perfect female emerged on May 10, 1938.

Mr. Hans L. Stecher exhibited several specimens of the *Pronuba* moth as well as other specimens from Staten Island and New Jersey.

Mr. Davis called attention to the description of a thrips, *Asprothrips raui,* by Mr. J. D. Crawford representing a new genus and a new species.

Mr. Davis exhibited a number of cicadas of 19 species that he had recently spread and labeled. *Diceroprocta apache* as found at Indio, Cal. is of interest because it varies from specimens with black bodies to pale chocolate colored individuals. In some parts of its range only black bodied forms occur. *Okanagodes pallida* from Westmoreland, south of the Salton Sea, varies from pale green to straw color, and fits well its environment. *Clidophleps vagans,* originally named from a single individual found in an automobile, is now known to occur at times in considerable numbers in San Bernardino County, Cal. Six specimens collected by Arthur T. McClay near Victorville, June 24, 1937 were shown.

The paper of the evening was a talk by Mr. Rau on "The Theoretical and Practical Application of Biological Control to Greenhouse Insects," the substance of which will be published separately in a series of papers. Mr. Rau illustrated his talk with living specimens.

George S. Tulloch
Secretary pro tem.

EXCHANGES

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

DIURNAL LEPIDOPTERA.—Have many desirable western species to exchange, including *Argynnis atossa, macaria, mormonia, malcolmi, nokomis; Melitaea neumoegeni; Lycaena speciosa;* etc. Send lists. Dr. John A. Comstock, Los Angeles Museum, Exposition Park, Los Angeles, Calif.

CATOPINI: *Catops* (*Choleva*), *Prionochaeta, Ptomaphagus.* —Wanted to borrow all possible specimens of these genera from North America for a revisional study. Correspondence solicited. —Melville H. Hatch, Dept. of Zoology, Univ. of Wash., Seattle, Wash.

BUY OR EXCHANGE: Pinned Microlepidoptera and papered Pieridae of North America. Full data with all specimens. Named material of all groups offered. Alexander B. Klots, College of the City of New York, New York City.

EXCHANGE OR FOR SALE.—*Catocala herodias* (Gerhardi), *Graptolitha viridipallens* and others. Wanted: Rare N. A. Macro-Lepidoptera. F. Lemmer, Lakehurst, N. J.

WANTED.—North American CHRYSIDIDAE for exchange or determination, with privilege of retaining duplicates. W. G. Bodenstein, Dept. Entomology, Cornell University, Ithaca, New York.

PENTATOMIDAE: Want to buy or exchange Petatomidae from the United States and Mexico. Herbert Ruckes, College of the City of New York, 17 Lexington Ave. N.Y.C.

LOCALITY LABELS—5 in strip, 1 to 3 lines. 75c per thousand. Pamphlet price list, samples upon request. Any size type. 3½ point, $1.00 per thousand. George F. Michels, Printing—604 Hollenbeck St., Rochester, N. Y.

ACALYPTRATE DIPTERA OF THE WORLD wanted for determination or in exchange for other insects. Geo. Steyskal, 23341 Puritan Ave., Detroit, Mich.

LOCALITY LABELS.—3½ or 4 point type; 40c per five hundred, 60c per thousand, 40c for each additional thousand, same type. Type labels on colored paper 10c extra. Good paper, clean work, no trimming. The Nature Co., Box 388, Lawrence, Kansas.

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BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

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The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

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BULLETIN
OF THE
BROOKLYN ENTOMOLOGICAL SOCIETY

VOL. XXXIV DECEMBER, 1939 No. 5

COLLECTING NOTES ON THE FAMILY ASILIDAE (DIPTERA).

BY F. S. BLANTON, Bureau of Entomology and Plant Quarantine
U. S. Department of Agriculture.

The purpose of this paper is to record some of the observations made by the writer while collecting species belonging to this interesting family of Diptera. Although the family is represented in the writer's collection by considerably over 200 species, a number of these have been added through exchanges. This paper records some 63 species of Asilidae collected by the writer, and includes collecting notes for most of the species. Although not designed or likely to be of any great help to the specialist in this family, the paper may be of some help to the amateur.

The family Asilidae has always been of great interest to the writer, and even when he was a small boy the "antics" of some species completely captivated his attention. These antics included their turning the head from side to side while looking for prey. One very small species, *Holopogon guttula,* always takes the writer back to his experiences in the infantry. It seems to be able to do "right dress," "left dress," "about face," "forward march," and "backward march" in "double-quick" time. There are other species that go through some of these same capers.

It was most interesting to watch a rather large species of robber fly in southern Alabama while it was feeding on large bees and wasps. According to Dr. Bromley, this was *Diogmites* sp. It would grasp a twig and hang by one or, at the most, two legs while using the remaining legs to maneuver the sting away from its mouth. The prey was kept at more or less legs' length, but eventually the fly would turn its head to the prey and insert the proboscis. Even though the prey would sometimes be as large as this fly, it would seldom struggle from the time the proboscis touched.

Many species resemble bees. The species of *Bombomima,* especially, resemble the bumblebees.

NOV 16 1939

Proctacanthus milbertii, a common species in southern Alabama, was called a "boo-hoo" by the small boys of that particular section. As a small boy the writer also called this fly a "boo-hoo," probably because it made a sound like "boo-hoo" while in flight. In 1932 the writer visited this section again and had the opportunity to check on this species and the common name which had been given to certain members of the family.

The name struck the writer as being rather appropriate when applied to *Proctacanthus milbertii,* as it *did* make a rather low-pitched "boo-hoo" sound as it flew in nervous spurts close to the ground. There seemed to be an irregular succession of wing beats and at each of these the sound "hoo" could be heard. The longer the flight, therefore, the more "hoo's" to be appended.

Several small boys were taken for a hike through woods and fields and all agreed that this species was a typical "boo-hoo." There were other "boo-hoo's," of course, and these were designated as little, big, black, or red "boo-hoo's." Although none of these boys knew anything about entomology, they recognized the characters that caused certain Asilidae to fall into the "boo-hoo" tribe. They also recognized the beneficial qualities of the family, since all had witnessed them catching and killing insect pests. Not a few of the group had been bitten by some species of the Asilidae, and the writer was informed that a large species which occurred in the spring could inflict a severe bite. This was probably *Dizonias tristis,* according to Bromley, who informs the writer that this species is the worst biter he knows.

A number of Asilidae have been identified for the writer by the late J. M. Aldrich and by J. Wilcox, C. T. Greene, Charles Martin, Maurice James, and Stanley Bromley. While the writer also has identified a number of specimens, in order to have all identifications confirmed Dr. Bromley, at the writer's request, has checked the entire collection and the appended list. At Dr. Bromley's suggestion these notes have been prepared for publication. The writer gratefully acknowledges the assistance of all the above mentioned workers.

The number of specimens collected is placed in parenthesis after the notes on each species. The dash between the names of localities "Manchester–Rupert" means from Manchester to Rupert.

LIST OF SPECIES WITH NOTES.

Andrenosoma fulvicauda (Say). *New York:* L. I., Babylon, July; on oak tree trunk. (2.)

Asilus angustipennis Hine. *New York:* L. I., Centereach, Sept. (1.)

Asilus auricomus Hine. *New York:* L. I., Babylon, July–Aug. (2.)

Asilus autumnalis Banks. *New York:* L. I., Selden, Sept.; Fire Island, Sept. (2.)

Asilus erythrocnemius Hine. *New York:* L. I., Babylon, June; Centereach, Sept.; *Florida:* Ocala, Nov. (9.)

Asilus flavofemoratus Hine. *New York:* L. I., Babylon, June–July; Dix Hills, June; Farmingdale, June; Belledaire, June; Wildwood Park, June; *Virginia:* Petersburg, May. On twigs in open woods. (54.)

Asilus gracilis Wied. *Alabama:* Atmore, July (Alton Blanton). (1.)

Asilus lecythus Walk. *New York:* L. I., Farmingdale, June; Centereach, June–Sept.; Selden, Sept.; Babylon, June–July; *Florida:* Bratt, April, 1933 (Alton Blanton). (19.)

Asilus maneei Hine. *New York:* L. I., Babylon, July–Sept.; Dix Hills, Aug.; Half Way Hollow Hills, Aug. Always taken on trunks of trees, sometimes on pine but usually on oak. In Babylon they seem to prefer oak, with black or very dark bark. (116.)

Asilus novae-scotiae Macq. *New York:* L. I., Babylon, July–Sept. (3.)

Asilus notatus Wied. *New York:* L. I., Babylon, June; Farmingdale, June; Belledaire, June; Islip, June; Wild Wood, St. Park, June; Tuxedo, July; *New Hampshire:* Bretton Woods, July; *New Jersey:* June; *Connecticut:* July; *Maine:* July; *Massachusetts:* July. (23.)

Asilus orphne Walk. L. I., Brentwood, May; Dix Hills, June; Belledaire, June; Islip, July; *New Hampshire:* Mt. Washington (Alpine Garden), July, 1935. (6.)

Asilus paropus Walk. *New York:* L. I., Babylon, June–Sept.; *Vermont:* Manchester–Rupert, July, *New Hampshire:* Bretton Woods, July; Half Way House to Gorham, July; *Maine:* July. (13.)

Asilus sadyates Walk. *New York:* L. I., Babylon, Sept. (2.)

Asilus sericeus Say. *New York:* Babylon, June–July; *New Hampshire:* Notchland, July. I have found this species very abundant sitting on the ground among bracken ferns at the edge of fields near the Belmont trail in Babylon. (47.)

Asilus snowi Hine. *New York:* Babylon, L. I., Aug.; *Vermont:* Bolton, July; Manchester–Rupert, July; *Maine:* July; *Ohio:* July; *Florida:* Bratt, April. (8.)

Atomosia puella (Wied.). *New York:* L. I., Dix Hills, August. Taken on the trunks of oak trees. (3.)

Bombomima affinis (Macq.). *Alabama:* Atmore, Nov. (Alton Blanton). (1.)

Bombomima champlanii (Walton). *New York:* L. I., Babylon, July; Huntington, Aug. (3.)

Bombomima cinerea (Back). *New York:* L. I., Babylon, May, on tree trunk. (2.)

Bombomima flavicollis (Say). *New York:* L. I., Babylon, June–July; Bear Mt., June. Found in or at edge of woods in sunny places, usually sitting on foliage of various plants. (19.)

Bombomima grossa (F.). *New York:* L. I., Babylon, July. Found in or at edge of deep woods in sunny places, one specimen taken on Belmont trail on maple tree foliage 8 or 9 feet high. (2.)

Bombomima thoracica (F.). *New York:* L. I., Babylon, June, 1936; Islip, July. In tall grass at edge of woods. (7.)

Bombomima virginica (Banks). *New York:* L. I., Babylon, June. (1.)

Cerotainia albipilosa Curran. *New York:* L. I., Babylon, July 21. (1.)

Cyrtopogon falto (Walk.). *New York:* L. I., Babylon, May–June–July; Dix Hills, June; Heckscher St. Park, May. Found in sunny places in deep woods. (14.)

Cyrtopogon lutatius (Walk.). *New York:* L. I., Babylon, May–June–July. These specimens have been taken in open sunshine on tree trunks and on stumps. Almost all of these, however, were taken on old junked cars near the Belmont trail and stream. (195.)

Cyrtopogon marginalis Loew. *New York:* L. I., Babylon, April (1 specimen), May. Most specimens were taken in a spot about 1 acre in size on the trunks of trees (white oak) from ground level to 3 feet above ground. A few were taken on ground near trunk of tree. (64.)

Dioctria baumhaueri Meig. *New York:* L. I., Babylon, May–July; Dix Hills, June. This species is found to be most abundant in an old field grown up with wild cherry bushes, near the U. S. Entomological Laboratory. Also common in fence rows on foliage. (341.)

Dioctria brevis Banks. *New York:* L. I., Babylon, July; Wildwood St. Park, June; Dix Hills, June. *Vermont:* Smugglers Notch, July. This species was taken in sunny places in open woods. (6.)

Diogmites discolor Loew. *New York:* Yonkers, Aug. (4.)

Diogmites misellus Loew. *New York:* L. I., Bablyon, July–Aug.–Sept.; Dix Hills, July–Aug.–Sept.; Centereach, Sept.; Islip, July. *Florida:* Bratt, June; *Alabama:* Atmore, June. This species has been found especially common in fence rows sitting on ground or green foliage near ground. In Babylon it has been frequently taken on cranberry plants near woods. (106.)

Diogmites salutans Bromley. *Florida:* Bratt, June–July–Sept. (Alton Blanton). (15.)

Diogmites umbrinus Loew. L. I., Fire Island Beach, Aug.–Sept.; Orient Point, Sept.; *Ohio:* July. These specimens were sitting on the ground in salt marsh grass near the beach. The vegetation was about waist high where these were taken. (13.)

Erax aestuans (L.). *New York:* L. I., Babylon, June–Aug.; Islip, July; *New Jersey:* Trenton, June. Some of these specimens were taken in freshly plowed fields on hot, dry soil. (34.)

Erax barbatus (F.). *New York:* L. I., Babylon, July; Islip, July; Fire Island Beach, July; *New Jersey:* June; *Alabama:* Atmore, July; *Florida:* Bratt, May, July. All specimens were taken on the ground. (47.)

Erax femoratus Macq. *New York:* L. I., Babylon, July; *Florida:* Bratt, June–Aug. (4.)

Erax interruptus Macq. *Florida:* Bratt, May–Sept.; *Alabama:* Bayminette, Aug.; Atmore, July–Sept. (Alton Blanton), on ground. (85.)

Erax rufibarbis Macq. *New York:* L. I., Babylon, Aug.–Sept.; *North Carolina:* Oct.; *Florida:* Bratt, Oct.; *Alabama:* Atmore, Nov. A number of specimens were taken on fence posts on a cool September morning. In North Carolina most specimens were taken in a field where hay had recently been cut. (47.)

Holcocephala abdominalis (Say). *North Carolina:* Oct.; *Florida:* Ocala, Nov. The specimens taken at Willard, N. C., were sitting on dead stems of "dog fennel," *Eupatorium compositifolium,* at edge of field and near woods. (8.)

Holopogon guttula (Wied.). *New York:* L. I., Islip, July; Babylon, June–July; Brentwood, July; Farmingdale, June–July; *North Carolina:* Carolina Beach, May. Found on ends of twigs, especially abundant near water. Several specimens were confined to a test tube and numerous eggs were laid. (134.)

Laphria canis Will. *New York:* L. I., Babylon, June–July; Dix Hills, June; Wildwood St. Park, June; Bear Mt., June. These were taken in thick woods in sunny places, sitting on foliage. (5.)

Laphria ithypyga McAtee. *New York:* L. I., Babylon, July. These specimens were taken on oak tree trunks. (3.)

Laphystia litoralis Curran. *North Carolina:* Carolina Beach, Oct. Thousands of specimens were sitting on white sand near the ocean but were so active that only two were caught in 3 hours. Later, in the cooler part of the afternoon, about 30 specimens were taken. (22.)

Mallophora bomboides (Wied.). *Florida:* Jacksonville Beach, Oct. In tall grass. (1.)

Nicocles politus (Say). *New York:* L. I., Centereach, Sept.; Selden, Sept.; Medford Sta., Sept.; Hither Hills State Park, Sept.; *North Carolina:* Chinquapin, Oct.; *Alabama:* Atmore, Nov. On Long Island this species is most abundant on hillsides supporting very little growth and usually covered with low bushes of huckleberries, *Vaccinium,* and myrtle (*Myrica asplenifolium*). The flies sit on the leaves of this plant and on twigs among the plants. The male has fine silver hairs on the end of the abdomen and has been observed hovering in front of the female, waving the abdomen in the sunlight. (104.)

Ommatius tibialis Say. *New York:* L. I., Babylon, June–July; Islip, June and July; Laurel Beach, Aug. Found on dead twigs. (94.)

Proctacanthus brevipennis (Wied.). *New York:* Half Way Hollow Hills, June; Babylon, June–July; *Carolina:* Willard, May. (15.)

Proctacanthus milbertii Macq. *Alabama:* Atmore, Oct.–Nov.; *Florida:* Bratt, Sept. Common in open fields and on dirt roadways, fence rows, open sunlight, etc. (17.)

Proctacanthus philadelphicus Macq. *New York:* L. I., Babylon, July–Aug.–Sept. These specimens are quite numerous in old fields, fence rows, etc. The species has a wide distribution and is found in many plant associations but usually in the open sunlight. (41.)

Proctacanthus rufus Will. *New York:* L. I. West Hampton Beach, July. On ground. (1.)

Promachus bastardii (Macq.). *New York:* L. I., Babylon, July. Near woods. (11.)

Promachus fitchii O. S. *New York:* L. I., Babylon, July. (3.)

Promachus rufipes (F.). *North Carolina:* Willard, Oct. These specimens were taken at fence rows dividing dense woods and open fields. (4.)

Psilonyx (*Leptogaster*) *badius* Loew. *New York:* L. I., Babylon, July. (2.)

Psilonyx (*Leptogaster*) *favillaceus* Loew. *Vermont:* Manchester–

Rupert, July; *New York:* L. I., Babylon, July. In tall grass. (3.)

Psilonyx (*Leptogaster*) *flavipes* Loew. *New York:* L. I., Wildwood State Park, June. Babylon, June–July. (5.)

Psilonyx (*Leptogaster*) *incisuralis* Loew. *New York:* L. I., Babylon, July. (1.)

Psilonyx (*Leptogaster*) *pictipes* Loew. *New York:* L. I., Islip, Babylon, June. Found sitting in short grass in shade of wild cherry tree. (4.)

Psilonyx (*Leptogaster*) *virgatus* Coq. *New York:* L. I., Farmingdale, June. In grass. (1.)

Stichopogon argenteus (Say). *New York:* L. I., Fire Island Beach, Sept.; Oak Beach, Aug.–Sept. This species was found in abundance on the sand near the edge of the ocean as well as back in the dunes. (321.)

Stichopogon trifasciatus (Say). *New York:* L. I., Babylon, July–Aug.; Islip, July; Fire Island Beach, July–Sept.; Oak Beach, July. This species is found on sand. (149.)

Townsendia niger Back. *North Carolina:* Willard, May. (1.)

Variation in the head hairs of Culex apicalis larvae.—In many of the descriptions of the larval stage of this mosquito the statement is made that the, "upper and lower dorsal head hairs are single and long" and no mention is made of the variations from this condition. In order to determine the extent of these variations 5000 fourth stage larvae collected from all parts of the state of Massachusetts were mixed together and a sample of 225 specimens was removed and examined. The results were as follows:

All head hairs single	30%
Upper right hair double, all others single	10%
Upper left hair double, all others single	10%
Both upper head hairs double, lower hairs single	26.5%
All head hairs double	13.5%

Of the remaining 10%, 9% were other combinations of single and double hairs and 1% were combinations of single, double and triple hairs. It would appear that the description of the head hairs should be: head hairs with all combinations from the complete single to complete double condition, occasionally some of the hairs triple.—George S. Tulloch, Brooklyn College, Brooklyn, New York.

BROCHYMENA FLORIDA, A NEW SPECIES OF PENTATOMID FROM FLORIDA.

By Herbert Ruckes, College of the City of New York,
New York City.

In examining collections of *Brochymena* from many museums and State Universities, I have been impressed with the non-conformity of certain specimens, usually assigned to the species *B. arborea* (Say), with the original description and the usually accepted determinations of these in standard collections. In every instance these questionable specimens have the facies of *B. arborea* but differ from that species in very definite respects. Moreover, these specimens always bear locality labels from some collecting ground in southern Florida. Indeed, in several collections they have been definitely, but erroneously, identified as *B. poeyi* (Guer.). I fear that all the continental records of the latter species, which is endemic to Cuba, may be incorrect and that specimens so assigned are in reality the species I herewith describe and name *Brochymena florida*. In the future it will be necessary to separate *B. florida* from the better known *B. arborea* and the confused and doubtful records of *B. poeyi*.

Brochymena florida, n. sp.

Form oval, subdepressed, roughish, faceted; color yellowish or reddish brown rather than grayish brown as in *arborea;* distance across head just in front of eyes one third greater than transverse distance between subapical teeth so that sides of head tend to converge anteriorly (in *arborea* this distance averages only about one sixth greater and the sides of the head are more nearly parallel); juga subequal to tylus, very seldom longer and then by only a very small fraction of their width at their tips; the outline of the head in front of subapical teeth arcuate or nearly so, the edges of the juga being slightly curved (in *arborea* the juga are frequently distinctly longer than tylus and an appreciable rectilinear sinus between their tips is usually evident, the edges of the juga are more nearly straight and the outline of the head in front of the subapical teeth is more nearly triangular-truncate); dorsal surface of the head less undulant than in *arborea;* first antennal segment reaches well beyond the tip of the subapical tooth and frequently as far forward as the tip of head (in *arborea* this segment is shorter, only occasionally does it reach more than midway beyond the tooth); pronotal surface not as strongly undulant as in *arborea* with the anterior median rectilinear depressed area more shallow than in that species; humeri, as in allied forms, quadrangular, with a prominent tooth at the front and hind corner and at least one smaller one between; *the dorsal lateral edge of the humerus is not raised in an oblique smooth bar or obtuse ledge as in arborea and there is no horizontal sulcus between the humeral teeth and its dorsal surface* (this sulcus is usually very pronounced in *arborea*), *the dorsal humeral surface is gradually continuous to the lateral edge and the whole humerus is not block-shaped and thickish as in arborea;* basal third of scutellum while swollen is certainly not tumid and its highest point is not much raised above the disc of the pronotum (in *arborea* usually this portion of the scutellum is quite high and its surface very undulant); femora with fuscous markings usually restricted to the distal half of the shaft (in *arborea* they extend onto the proximal half and in many instances as far proximad as the trochanter); tibiae distinctly sulcate with the edges raised and quite evident (in *arborea* the edges are usually indistinct and the sulcus shallow); the annulations on the tibiae are distinctive in that there are usually only two broad black annuli, one toward each end of the shaft, and a much smaller central one, indistinct and frequently represented by only a few darkish flecks (in *arborea* the dark annuli, three in number are more nearly subequal in size, especially on the fore tibiae, and the middle dark blotch is rectilinear and conspicuous); the first tarsal joint has the major portion of its dorsal surface pale and frequently the second joint is pale also; exposed portion of the connexivum alternated as in *arborea* but the dark bars do not reach the very edge of the segments, or if they do they are weak there and inconspicuous; the ventral stigmata in oblique lines, mentioned by Say for *arborea* are much less conspicuous than in that species, the colors being paler and the dark ring around each spiracle much narrower; anterior and posterior angles of ventral abdominal segments either lack the black triangular spot, so characteristic for *arborea* or the marks are very obsolescent, the females have a greater tendency to retain these spots than the males, in which case then the dark bands on the connexivum reach the edge of the segments; the horseshoe-shaped fuscous or black vittae on the lateral ends of each ventral segment, also so characteristic of *arborea,* are lacking or very indistinct; genitalia, both male and female somewhat heavier than in *arborea;* the exposed posterior surface of the hook of the male paramere is flattish and in some specimens shallowly sulcate, the lateral surface of the paramere appears dark fuscous and the mesal surface much paler, tawny or light fuscous (in *arborea* the hook of the paramere has its posterior surface slightly convex and the lateral surfaces are more nearly concolorous); female with a small deep triangular sinus between the proximal median corners of the basal valves and the mid-point of the posterior edge of the previous segment.

Size: Females average 18 mm. long and 10 mm. across humeri. Males average 14 mm. long and 8½ mm. across humeri.

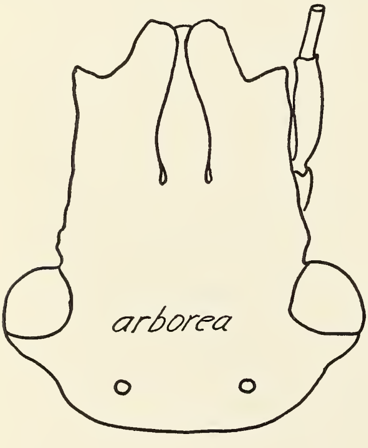
Described from nineteen specimens in the combined collections of Purdue University (Blatchley Collection) and the American Museum of Natural History (Mrs. Annie T. Slosson Collection).

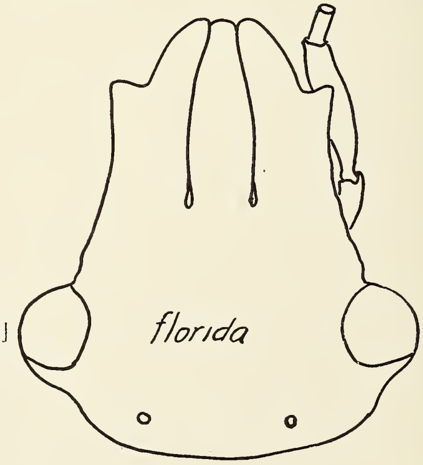
Type: Female, Tampa, Fla. Coll. Mrs. A. T. Slosson. A.M.-N.H. Ac. No. 26226. Deposited in the American Museum of Natural History.

Allotype: Male, Florida, same data.

Paratypes: Purdue University Collection: Males: Dunedin, Fla. 1/13/30, --/13/11, 2/29/13; Mooseft, Fla. 3/2/18; Royal Palm Pk., Fla. 12/12/24; Cape Sable, Fla. 2/23/19. Females: Dunedin, Fla. 1/20/18, 4/13/25; Little River, Fla. 8/1/31 (J. C. Bradley); Royal Palm Pk., Fla. 12/12/34, a second specimen, no date, Coll. P. M. Jones; Cape Sable, Fla. 2/23/19 (2 specimens).

American Museum Collection, in addition to the types: Males: Biscayne Bay, Fla. 8/20/35 (2 specimens); another specimen from the A. T. Slosson Collection, no date; A.M.N.H. Acc. No. 26226. Female: La Belle, Fla. 4/27/12. Author's collection: One specimen, female, Winter Park, Fla., 8/8/39.





ADDENDA: Through an oversight in the printing of the descriptions of *B. lineata* and *B. dilata* (Bull. Brook. Ent. Soc. Vol. XXXIII; No. 5) the dimensions of the types were omitted. They are given at this time.

Brochymena lineata Type: Female 16¼ mm. long; 8½ mm. across humeri. Allotype: Male 16 mm. long; 8 mm. across humeri.

Brochymena dilata Type: Female 18¼ mm. long; 9½ mm. across humeri; 11¼ mm. across widest portion of abdomen. Allotype: Male, 17½ mm. long; 9 mm. across humeri; 10¾ mm. across widest portion of abdomen.

BOOK NOTES.

Food-plant Catalogue of the Aphids of the World Including the Phylloxeridae, by Edith M. Patch. 1938. Maine Agricultural Experiment Station Bulletin 393, pp. 35–431. Orono, Maine.

Dr. Patch crowns her many years of work on aphids with this volume, one of the most useful of publications. While, as she states, it "is a compilation from aphid literature up to and including 1935," the fact remains that it represents a vast amount of work. Of course, no worker with aphids will do without this Catalogue, if he can help it.

The Catalogue is arranged throughout in the order of the plant groups inhabited or fed upon by aphids. This part fills 231 pages. A Bibliography of 55 pages follows. There is an Index of Plant Families in 7 pages; and finally she has a specific Index to Aphids of 102 pages, with a few final lines of text-corrections. One excellent feature is that Dr. Patch is careful to explain wherever called for, the limitations of *that* part.

No book note is ever complete or perfect (!) without picking a flaw; and here is the *one* we have found. And it is emphatically not to be attributed to Dr. Patch, who simply followed accepted aphid literature by an authority. On p. 265 she has an "Unclassified Genus." This is *Termitaphis,* which is not only not an aphid, but not even an Homopteran. It is the type-genus of the heteropterous family Termitaphididae, which appears to be closely related to the Aradidae and certainly is in the superfamily Aradoideae.

We do wish some industrious heteropterist would do the same with the true bugs.—J. R. T.-B.

NOTES ON SOME MEXICAN SPECIES OF CHRYSOPS (DIPTERA—TABANIDAE) AND THE DESCRIPTION OF A NEW SPECIES.

By L. L. Pechuman, Cornell University, Ithaca, N. Y.

Due to the difficulty in securing material from Mexico, many of the specimens that are obtained are often of considerable interest. The writer recently had the opportunity of studying a number of specimens of *Chrysops* from Mexico, and even in this small lot of material one new species and two others of considerable rarity were found. It is to be hoped that more material in this group will be secured in the future.

The loan of specimens by Mr. T. H. G. Aitken and Dr. C. B. Philip is greatly appreciated.

Chrysops affinis Bellardi.

In a previous paper (1937, Rev. Ent. 7, p. 134) the writer redescribed the male of this species which had been unknown since its original description in 1859. Recently, through the kindness of Dr. Philip, I have been able to examine a female of this species. Since the female has been previously unknown, a description of this sex will not be out of place at this time. A single specimen collected in Mexico by McGunnell was examined.

Length—10 mm.

Head. Frontoclypeus orange with a black spot at apex, denuded except for salmon colored pollen in center; cheeks pollinose with rather long hairs which are dense below; cheek callosities shining orange, darker laterally; front above antennae yellowish brown pollinose with black integument showing through in vicinity of ocelli; frontal callosity very wide, narrowly separated from eyes; orange margined with black above; front slightly wider than high; first two antennal segments swollen, orange with dense black hairs; third segment black, paler at base, covered with fine pale hairs; palpi and proboscis orange, the proboscis becoming darker at apex.

Thorax. Dorsum brownish pollinose with three indistinct brownish stripes, paler laterally; scutellum brownish pollinose; pleura grayish brown pollinose with gray hairs. Legs with front coxae orange, fuscous at apex; middle and hind coxae black with gray pollen; all coxae rather densely covered with pale hairs; trochanters reddish brown; femora orange, slightly darker at apex; tibiae orange shading to reddish brown toward apex; hind tibiae with a row of stiff golden hairs; front metatarsi dark brown; middle and hind metatarsi reddish brown becoming darker at apex; remainder of tarsal segments mostly black, some showing paler at base. Wings as in male (Pechuman, 1937, fig. 1) except discal cell with a hyaline spot in center and basal infuscation of second basal cell is not as extensive as in first.

Abdomen. Dorsum largely black with grayish yellow markings. Posterior margins of all segments pale. First tergite with pale lateral margins; second with pale lateral margins and three pale more or less triangular invaginations of the posterior border, the center one of which reaches the anterior margin; third to fifth segments with similar pale invaginations none of which reaches the anterior margin; remaining segments mostly dark. Apex of abdomen with rather dense pale hair. Venter orange with a wide median fuscous band and a lateral one on each side; densely covered with pale hair.

Heterochrysops giganteus described by Kröber (1925, Konowia *4*, p. 229) is undoubtedly the female of *C. affinis*. The presence of a hyaline spot in the discal cell would place *C. affinis* in Kröber's *Heterochrysops,* but as noted previously the discal cell of the male is completely infuscated.

Chrysops apicalis Bellardi.

This is the last of Bellardi's species which has been completely unknown to subsequent workers. According to Bellardi, the type was deposited in the Zoological Museum of Paris, but the writer was unable to locate the type in any of the Paris museums or in the British Museum. Through the kindness of Prof. Alceste Arcangeli and Dr. Enrico Tortonese, however, the type was located at the Museum of Zoology of the University of Turin. These gentlemen sent the writer a description of the type and colored drawings of the wing, a dorsal view of the head, thorax, and abdomen, and lateral and ventral views of the abdomen.

After a study of these drawings the writer is convinced that *C. apicalis* is the male of *C. scalarata* Bell., the description of which is on the page preceding that of *C. apicalis* in Bellardi's paper.

The wing pattern is the same as in *C. scalarata* except that the basal cells are two-thirds infuscated and the projection of the crossband along the anterior branch of the fifth longitudinal vein (M_3) is shorter than in most female specimens. The first antennal segment apparently is swollen about as much as in the average female specimen. The dorsum of the abdomen is essentially like that of the female but mid-dorsal spots are lacking. The yellow lateral spots on the first and second tergites coalesce as in the female, but the black stripe separating this spot from the yellow on the sides of the abdomen is incomplete. In several females examined, however, a similar condition has been found. The markings of the venter are the same as in the female.

Ricardo (1901, Ann. Nat. Hist. *8,* p. 304) records two *Chrysops* from Mexico which she believed to be males of *C. scalarata.* She also noted that the basal cells were partly infuscated. It is not unusual, however, for a species of *Chrysops* to have clear basal cells in the female and infuscated ones in the male.

The possibility that *C. scalarata* is the same as *C. lateralis* Wied. has been discussed by several workers, but probably nothing definite can be decided until Wiedemann's type is studied.

Chrysops facialis Towns.

This species has been previously known from a very few specimens, but the writer was able to examine a series of twenty-five specimens from Juan Manuel, Durango, Mexico, collected at an altitude of 9,300 ft. by A. Mead and M. Embury on May 29 and June 3, 1937. Two specimens from Arizona were also studied.

On the whole there was little variation in the specimens examined. The Arizona specimens had in general more yellow especially on the antennae and legs. In the Mexican specimens the antennae were yellow only on the inner portion of the first segment and the front coxae were usually dark. The disk of the frontal callosity was about half yellow in all the specimens examined; the species was originally described with a black frontal callosity but Brennan (1935, U. Kans. Sci. Bul. *22,* p. 292) had already doubted the validity of this character. In some specimens the geminate spots on the second abdominal segment do not meet along the anterior margin of the segment, and several individuals had small lateral spots on the third segment. The apical spot was quite wide in all specimens examined, but in several it scarcely more than entered the apex of the second submarginal cell. In length the Mexican series varied from 6.6 to 8.9 mm., with an average of 7.5 mm.

Collected at the same time as the series of *C. facialis* were thirteen specimens which showed affinities with that species, but were so distinct in many respects and without intergrades with *C. facialis* that they may be designated as representing an undescribed species.

Chrysops mutata n. sp.

Female. Length—5.5 mm.

Head. Antennae black, somewhat shining; first two segments rather densely covered with black hairs; scape swollen, pedicel less so. Front slightly wider than high, grayish pollinose below frontal callosity, shading to yellowish above; denuded in vicinity of ocelli; long blackish hairs scattered over surface. Frontal callosity narrowly separated from eyes; black, yellow on disk; a denuded line connects frontal callosity and lowest ocellus. Frontoclypeus largely shining black; two elongate denuded yellowish spots laterally and a yellow pollinose area in the center divide the black of the frontoclypeus into four spots which coalesce below. Cheeks yellow pollinose above; oral margins shining black with long grayish hairs. Palpi blackish brown with grayish hairs. Proboscis black, reddish brown above.

Thorax. Dorsum black with golden hairs; two pale lateral stripes are vaguely indicated. Pleura black with grayish pollen; hairs of pleura grayish white. Halteres yellow. Legs black; base of middle tibiae and most of middle and hind metatarsi yellowish. The wing pattern is similar to that of *C. facialis* but the first basal cell is infuscated more nearly to the end; the crossband includes all of the fifth posterior cell and spreads into the anal area. The apical spot is comparatively wide and extends into the apex of the second submarginal cell. The hyaline triangle extends beyond the second longitudinal vein but does not quite separate the apical spot from the crossband.

Abdomen. Dorsum of abdomen dull yellow. First tergite with a wide quadrate black spot which reaches the hind margin and reduces the yellow to a narrow lateral band on each side; second tergite with a large black emarginate spot which is narrower apically and which does not reach the posterior margin of the segment; a small black dot lies laterad on each side of the large spot; third tergite with four black spots with their bases united along the anterior margin of the segment; fourth and fifth segments each with four similar black spots which are entirely separated from each other; sixth and seventh segments mostly black. Segments two to seven inclusive have yellow hind margins. Venter with median and lateral rows of black spots which increase in size until on the fifth and following segments they unite to form a black band along the base of the segment.

Type data. Holotype female, Juan Manuel (near El Salto), Durango, Mexico, May 29, 1937 (Milton Embury). Alt. 9,300 ft. Paratypes, ten females, same data as holotype; one female, same locality as holotype, June 3, 1937 (A. Mead); one female, Hidalgo, Mexico, June 1, 1937 (A. Mead).

Holotype and two paratypes in the collection of the California Academy of Sciences, three paratypes in the collection of the writer, two paratypes each in the collections of Dr. C. B. Philip, Mr. T. H.

G. Aitken, and Mr. Mont A. Cazier, one paratype in the collection of the U. S. National Museum.

Variations. In several specimens the inner sides of the palpi and the proboscis are reddish brown; in others the apex of the fifth posterior cell is paler than the rest of the cell. In some specimens the round black spots on the second tergite are larger than in the type and in others they are completely absent. In several specimens the black spots on the third, fourth, and fifth segments are coalesced so as to form more or less regular bands across the bases of the segments. The length in the series varies from 4.8 to 5.7 mm. with an average of 5.5 mm.

Comparative Notes. *C. mutata* resembles *C. facialis* in many respects; the general wing pattern and shape of antennae is the same, and the arrangement of the black spots and the presence of a pollinose stripe on the frontoclypeus show a definite relationship to *C. facialis*. *C. mutata* differs from *C. facialis* in the generally smaller size, grayish pleural pile, greater extent of infuscation in the first basal and fifth posterior cells, the predominately black legs, and the greater extent of black on the abdomen.

Note on Injury to Gypsophilia Paniculata by the Jerusalem Cricket, Stenopelmatus Fuscus Hald. (Tettigoniidae—Orthoptera).

By J. J. du Bois

The author has chanced to make some interesting observations both in regard to the food habits and to economic damage inflicted by *Stenopelmatus fuscus* Hald. on *Gypsophilia paniculata flora plena* at Turlock, California, where that plant is a valuable commercial crop.

The area observed was a planting of about ten acres of varying years of growth and was observed over a period of three years.

The approximate damage sustained was ten to twenty-five per cent kill on young plants, but it was not so heavy on the older stock, as they did not kill the plants but simply destroyed some shoots.

The insects come to the surface at night and early morning and follow the shoot down to the graft eating all or else one half or more of the stem, leaving just a shell on one side. They often eat a little of the root.

Most of the damage is done in the early spring when the weather has turned warm and the plants are making a good growth. New land that has had lots of weeds and trash on it for years seems to be the source of the worst infestation.

A SYNOPSIS OF THE ODYNERUS BOSCII GROUP IN NORTH AMERICA (HYMENOPTERA, VESPIDAE).

By Richard M. Bohart, University of California, Los Angeles.

The species of *Odynerus* related to *boscii* Lepeletier can be distinguished from those of other North American groups of the subgenus *Rygchium* by the following combination of characters:

> Lateral angles of propodeum sharp and dentiform; dorsal surface of first abdominal tergite with at least a few scattered punctures medially; second tergite well punctured throughout and usually reflexed apically; male middle femur without a basal depression; last segment of male antenna nearly conical, slightly curved, not conspicuously flattened; depression on vertex of female not extending beyond lateral ocelli.

The *boscii* group appears to be most closely related to the *rugosus* group, and *exoglyphus* is possibly an annectant form as indicated under the discussion of that species. On the other hand there is some affinity shown towards the *annulatus* group and a nice parallelism exists in color variation between the races of *annulatus* Say and *boscii*. This has resulted in a confusion of the two species in many collections. Several related species occur in Europe. Of these, *O. dantici* (Rossi) closely resembles *boscii auranus*.

Part of the material used in this study was borrowed from the California Academy of Sciences, the U. S. National Museum, the University of Kansas, Washington State College, Pomona College, J. Bequaert, P. H. Timberlake, E. G. Linsley, and C. D. Michener. I am particularly grateful to Dr. Bequaert for his valuable advice and loan of material from his extensive collection.

Key to the Odynerus Boscii Group in North America.

1. Hair on horizontal portion of first tergite, as seen in profile, longer than median ocellus; apex of male clypeus semicircularly incised; body black marked with yellow or whitish 2
   Hair on horizontal portion of first tergite shorter than median ocellus; apex of male clypeus not semicircularly incised 3
2. Black marked with yellow . . . . *exoglyphus*
   Black marked with whitish . . . . *exoglyphus albovittatus*
3. Inferior ridge of propodeum below the lateral angle crenulate; first tergite uniformly punctured all over; male clypeus about one and a half times as broad as long, apex usually almost straight except for small lateral teeth; subapical

tooth of male mandible much larger and higher than the middle tooth . . . . *fusus*

Inferior ridge of propodeum below lateral angle not crenulate; male clypeus almost as long as broad, apex usually evenly concave; subapical tooth of male mandible only slightly higher and larger than the middle tooth 4

4. Body markings black, reddish, and yellow; or if black and yellow, sixth tergite black. Dorsal surface of first tergite smooth and impunctate except for lateral areas of coarse punctures and a few scattered punctures medially *boscii boscii*

Body markings almost entirely yellow; black, whitish, and reddish; or black and yellow with the sixth tergite marked with yellow 5

5. Body largely black and yellow, sixth tergite marked with yellow in both sexes; apex of second tergite with a varying amount of reflex . . . . *boscii auranus*

Body markings not mainly black and yellow 6

6. Body largely yellow with small amounts of reddish; apex of second tergite usually strongly reflexed . . *boscii azotopus*

Body black, whitish, and red; legs red . . . . *boscii albivestis*

Odynerus fusus Cresson

Odynerus fusus Cresson, 1872. Tr. Amer. Ent. Soc., 4: 238.

Odynerus fuscus Dalla Torre, 1894. Catal. Hymenopterorum, 9: 70.

The range of *fusus* over Mexico and the southern and eastern parts of United States appears to be much the same as that of *boscii* and the two species are very closely allied. The clypeal and mandibular differences in the male should be sufficient to separate the two. The puncturation of the first abdominal tergite and crenulation of the propodeal angles are not characters of sterling specific worth but they form a convenient means of determination particularly if only a female is at hand.

O. fusus varies markedly in coloration from the predominantly black and yellow northern type to the more reddish and yellow southern type. This variation seems hardly constant enough to warrant the setting up of subspecies. The following is a brief redescription of the species as treated in this paper.

Black and yellow, marked with reddish in varying degrees, sometimes almost entirely reddish; wings smoky, violaceous. Pubescence obscure, pale and hardly two ocellus lengths on the front. Puncturation moderate to coarse and covering entire

> body except front face of pronotum and hind face of propodeum which is irregularly and often weakly striate. Mandible of male five-toothed, subapical tooth much larger and protruding much farther than middle tooth; apex of clypeus in male nearly straight or slightly convex between lateral teeth, male clypeus about one and a half times as broad as long; last antennal segment of male curved but not flattened, reaching beyond the base of tenth; inter-ocellar area slightly swollen; pronotal carina strong, lateral angles sharp; propodeum with its dorso-lateral face bearing very large punctures, terminating in dentiform angles laterally and near postscutellum and crenulate between lateral angles and insertion of abdomen, hind face concave; male middle femur normal; apex of second abdominal tergite impunctured and often reflexed; length to apex of second tergite, male, 11–13 mm., female, 11–14 mm.

Records. Massachusetts, Michigan, New Jersey, Illinois, Mississippi, Oklahoma, Georgia, Florida, and Texas; Cuernavaca and Guadalajara, Mexico.

Odynerus boscii Lepeletier

> *Odynerus boscii* Lepeletier, 1841. Hist. Insect. Hymén., 2:637.
>
> *Odynerus castigatus* Saussure, 1852. Etud. Fam. Vespid., 1:178.

Although it is not a common species, *boscii* occurs from Massachusetts to Coahuila, Mexico. It varies in coloration much as does *fusus* from which it is separated mainly by the different shape of the clypeus in the male. The typical form varies from black and yellow to black, reddish and yellow but only the three western races have sufficiently distinct markings to warrant subspecific names. The following is a short redescription of the typical form as defined in this paper.

> Black, marked with yellowish and usually with reddish, sometimes mostly reddish and yellow; wings smoky and violaceous or reddish. Pubescence pale and short. Punctuation moderate to coarse and covering entire body except front face of pronotum, hind face of propodeum, and dorsum of first abdominal tergite which is sparsely punctured only. Mandible of male five-toothed, subapical tooth not much larger or higher than middle tooth; apex of male clypeus evenly concave, the clypeus almost as long as broad; last antennal segment of male curved but not flattened, reaching to base of tenth; inter-ocellar area slightly swollen; pronotal carina

strong, lateral angles sharp; propodeum with its dorso-lateral face bearing very large punctures, terminating in one or more dentiform angles laterally and near postcutellum but not crenulate between lateral angles and insertion of abdomen, hind face concave; male middle femur normal; apex of second abdominal tergite impunctured and often reflexed; length to apex of second tergite, male, 11–13 mm., female, 11–14 mm.

Records. Massachusetts: Stony Brook. Michigan: Muskegon and Ogemaw Co., New Jersey: Ramsey and Newfoundland. Texas: Austin. Mexico: One male, Torreon, Coahuila, June 17, 1937 (A. R. Mead).

Odynerus boscii azotopus Bohart, n. subsp.

This subspecies resembles the more yellow specimens of *annulatus oslari* Cameron which occurs over the same region. The puncturation of the first abdominal tergite varies from nearly smooth to strongly punctured in a series from a single locality. Also, the clypeus is unusually variable in shape.

Male. Yellow; antenna mostly, vertex and occiput mostly, mesonotum, legs partly, bases of first two abdominal tergites, light reddish; antenna apically, ocellar area, margin of mesonotum, black. First abdominal tergite strongly punctured throughout; apical margin of second tergite strongly reflexed flange-like; length to apex of second tergite 9.5 mm.

Female. Coloration about as in male. Black in ocellar area restricted to margins around ocelli. Length to apex of second tergite 12 mm.

Holotype male, five miles north of Indio, California, Apr. 10, on *Prosopis juliflora* (C. D. Michener); allotype female, Indio, Calif., Oct. 28, 1933 (P. H. Timberlake). Paratypes, Arizona: Two females, Phoenix; California, twenty males and nineteen females from the following localities: Furnace Creek, Inyo Co.; Blythe, Yermo, and Barstow, San Bernardino Co.; Coachella, Indio, and Palm Springs, Riverside Co.; San Felipe Creek and Calexico, Imperial Co. Holotype and allotype in California Academy of Sciences, paratypes in collections of U. S. National Museum, J. Bequaert, P. H. Timberlake, E. G. Linsley, C. D. Michener, and the author.

Odynerus boscii auranus Cameron

Odynerus auranus Cameron, 1903. Invertebrata Pacifica, 1: 148.

This subspecies corresponds in color markings to *annulatus sulphureus* which occurs with it. Occasional specimens have a trace of reddish on the vertex or mesonotum but not on the first abdominal tergite. The reflexing of the apex of the second tergite varies considerably. In general the specimens from the eastern side of the Sierras have a greater amount of black markings and a lesser amount of reflex.

Records. Nevada: Ormsby Co. (Cameron type); Minden, July. Washington: Orondo, June. California: Lake City, Modoc Co.; Mammoth and Tioga Pass, Mono Co.; Putah Canyon, Solano Co.; Antioch, Contra Costa Co.; Lone Pine and Independence, Inyo Co.; Briceburg, Mariposa Co.; Sequoia National Park, Tulare Co.; Mt. San Jacinto, San Bernardino Co.

Odynerus boscii albivestis Bohart, n. subsp.

The black, white, and red aspect of this form makes it easily recognizable. A similarly colored phase of *annulatus* occurs with it.

> Male. Black; mandible mostly, clypeus, first antennal segment in front, large inter-antennal spot, lower orbit, prothorax in front, small spot on tegula, spot below tegula, spot on lateral angle of propodeum, spot on middle coxa, apical bands on tergites one to five and sternites two and three, a lateral attached spot on second tergite, whitish; antenna mostly, post-ocular spot, tegula mostly, two spots on scutellum, legs almost entirely, reddish; apex of antenna, fifth to seventh abdominal tergites, brown. Clypeus longer than broad; apex of second tergite strongly reflexed; third tergite coarsely punctured; length to apex of second tergite 9 mm.
>
> Female. Markings as in male with following exceptions: Mandible red; clypeus red and black; first antennal segment, lower orbit, and inter-antennal spot, red; pronotum white, red, and black; last abdominal segment red; venter black except for last sternite. Length to apex of second tergite 13 mm.

Holotype male, Grand Coulee, Washington, July 10, 1902; allotype female, Patterson Ferry, Umatilla Co., Oregon, June 18, 1936 (I. McCracken), on *Hymenopoptus*. Paratypes, Washington: One female, Grand Coulee, June 29, 1902; one female, Almota (R. W. Doane); one female, Hatton, July 23 (R. C. Shannon). Idaho: One female, Burley, July 6, 1931 (M. W. Sanderson). Oregon: One female, Arlington, July 15, 1931 (R. H. Beamer). Wyoming: One female, Granger, 6400 ft., August 5, 1934 (H. A. Scullen). Colorado: Two males, Mountain Home Lake, Fort Garland, 8300 ft., July 20–25, 1932. Holotype and allotype in California Academy of Sciences, paratypes in collections of University of Kansas, J. Bequaert, and the author.

Odynerus exoglyphus Bohart, n. sp.

Two other North American species of *Rygchium* with semicircularly incised clypeus in the male are *orasus* Cameron and *delicatus* Cresson which are closely related to *annulatus*. In these two species, however, both sexes have the clypeus incised, whereas in *exoglyphus* this character is found only in the male. *O. aldrichi* Fox which is intermediate between *Rygchium* and *Odynerus* s.s. has the clypeus of the male incised but in addition has strikingly deformed mandibles. Both sexes of *aldrichi* have continuous whitish transverse bands across the scutellum and postscutellum. A further relationship with *rugosus* Saussure and *leucomelas* Saussure is indicated by the dark-colored last tarsal segment in the males of the three species although this is least pronounced in *exoglyphus*.

Male. Black; mandible mostly, clypeus, first antennal segment in front, inter-antennal spot, lower orbit, post-ocular spot, pronotum in front, tegula mostly, spot below tegula, line on postscutellum, lateral spot on propodeum, legs mostly, apical margins of all abdominal segments except the last, lateral attached spots on first two tergites, second sternite almost entirely, yellow; inner surface of flagellum to the ninth segment, tarsi partly, fulvous to reddish; wings smoky, slightly violescent. Pubescence short and moderately thick, that on front about one to two ocellus lengths, that on mesonotum and first abdominal tergite about one ocellus length, that on remainder of abdomen minute. Head and thorax closely but not coarsely punctured, the punctures separated by less than a puncture diameter; horizontal surface of first and base of second abdominal tergites evenly punctured, the punctures separated by about three puncture diameters; second and to a lesser extent the following tergites coarsely punctured apically. Mandible obscurely five-toothed; clypeus with a semi-circular apical emargination; last antennal segment finger-like, as long as fourth, apically blunt; front face of pronotum punctured sparsely laterally; pronotal angles sharp but rounded; propodeum laterally rough and dentiform, hind face finely striate; middle femur without a baso-ventral depression; aedeagus and volsellae slender; length to apex of second tergite 9 mm.

Female. Markings, pubescence, and puncturation about as in male with exceptions as follows: Mandibles mostly black; clypeus with a median longitudinal stripe, two yellow spots on scutellum and on last abdominal tergite. Clypeus shallowly incised at apex; vertex with a small indistinct depression; length to apex of second tergite 11 mm.

Holotype, allotype, and eleven male paratypes, Indian Flat, Mariposa Co., California, June 3, 1938 (R. M. Bohart). Other paratypes, California: Davis Creek, Modoc Co.; Walker, Siskiyou Co.; Tuolumne Co.; Briceburg and El Portal, Mariposa Co.; Lone Pine, Inyo Co.; Kaweah, Tulare Co.; Putah Canyon, Solano Co.; Mt. Diablo, Contra Costa Co.; Paraiso Springs and Bradley, Monterey Co.; Santa Lucia Mts., Monterey Co. (C. D. Michener, Hastings Nat. Hist. Survey); Coalinga, Fresno Co.; four males, Tetley Park, San Bernardino Co., May 23, 1936, on *Potentilla glandulosa* (P. H. Timberlake). Other records: One male, Utah?; one female, Moscow Mt., Idaho; one female, Blue Mts., Washington, June 27, 1922 (V. N. Argo). The months of flight are May and June. Holotype and allotype in the California Academy of Sciences, paratypes in the collections of U. S. National Museum, University of Kansas, Academy of Natural Sciences of Philadelphia, J. Bequaert, P. H. Timberlake, E. G. Linsley, C. D. Michener, and the author.

Odynerus exoglyphus albovittatus Bohart, n. subsp.

This subspecies represents the white-marked Great Basin and Rocky Mountain race of *exoglyphus*. There does not seem to be any constant structural difference between the two races and occasional examples of *exoglyphus* show an approach in color to *albovittatus*.

Male. Black, marked as in *exoglyphus* but with whitish instead of yellow; last two abdominal segments black. Length to apex of second tergite 8 mm.

Female. Last abdominal segment and venter black except for disconnected stripe on second sternite; spot on second tergite isolated. Length to apex of second tergite 10 mm.

Holotype male, Mary's River, Elko Co., Nevada, 3000 ft. July 8, 1935 (P. H. Baldwin); allotype female, near San Jacinto, Elko Co., Nevada, 5900 ft., July 10, 1935 (P. H. Baldwin). Paratypes, Nevada: One male and four females, Elko Co., July, P. H. Baldwin). Wyoming: One male, Bridger Basin (S. Garman); one female, Yellowstone National Park, July 27, 1923 (A. L. Melander); one male and five females, Jennie Lake, July, 1935 (J. McSwain). Washington: Two males and six females, Toppenish, June to August (A. L. Melander and V. Argo). Oregon: Two males and one female, Harney Co., July; eight females, Alkali Lake, Lake Co., June 18, 1934 (S. C. Jones and J. Schuh). Holotype and allotype in California Academy of Sciences, paratypes in collections of U. S. National Museum, J. Bequaert, P. H. Timberlake, and the author.

NOTES ON BUTTERFLY MIGRATION. II.

By Harold I. O'Byrne, Urbana, Illinois.

Williams (1938) has reviewed the recent data on North American migrant butterflies, calling attention to the many gaps that still exist in our knowledge. The following notes on migratory butterflies I have accumulated since the publication of my preceding paper (O'Bryne, 1932) are presented in the hope of making further progress toward filling up these gaps—a task that can be completed only after the accumulation of many more records bearing on this subject.

Danaus plexippus Linn.

A flight of *Danaus plexippus* observed by me in St. Louis, and the adjoining portion of St. Louis County, Missouri, on April 25, 1935, is of interest since it suggests that spring flights of this species may occur frequently without being noticed because the butterflies are so far apart. On this occasion the butterflies were flying northward, and were seen more or less continuously during the day between the hours of 10 A.M. and 6 P.M. They flew for the most part at heights of less than four feet from the ground, rising higher only when necessary to pass objects which they could not fly around, although they seemed to prefer to fly around buildings and other high obstacles. They were therefore frequently diverted from their northward course, but invariably turned to the north again at the first opportunity. The direction of the flight had no relation to the direction of the wind, since there was no perceptible wind that day until the middle of the afternoon, when a strong breeze began to blow from the northwest without causing the butterflies to change their course. All the individuals that passed close enough to permit recognition of the sex were females.

Williams (1930, 1938) cites ten records of migratory flights of this species in Missouri; six of them were southward in the fall, while the direction of the other four was not recorded. Because the northward movement in the spring seems to consist of individuals flying independently, in marked contrast to the large aggregations that cause the southward autumn flights to be so conspicuous, observers of this species in the spring are urged to note the direction of flight of each individual in the hope of determining the frequency and extent of the migrations at this season.

Phyciodes picta Edw.

The range of *Phyciodes picta* does not extend into Missouri.

The only records known to me of its occurrence in that state refer to two specimens taken at Ranken, St. Louis County, on September 19 and October 10, 1937, by Dr. E. P. Meiners of St. Louis, who has kindly given me these data. The occasional occurrence of a species of butterfly far beyond its usual range might be caused by accidental flights of individual butterflies for unusually long distances, or by a temporary extension of the range of the species during a season of unusual abundance, breeding sometimes taking place in the newly occupied territory. Which one of these possibilities was operative in the present instance can not be determined without information as to the presence or absence of *P. picta* in western Missouri and the adjoining states to the west and southwest, during the same autumn.

Ascia monuste Linn.

Migrations of *Ascia monuste* in Florida have been described by numerous observers, whose records are reviewed by Williams (loc. cit.). A flight of this species was observed on June 13, 1936, near St. Augustine, Florida, by my wife and her sister, Miss Dorothy Schregardus. They reported huge numbers of white butterflies flying northward, and captured a specimen which I identified afterwards as a male of *A. monuste*. The flight occurred on a windy day with the wind coming strongly from the east, and the butterflies seemed to keep on the leeward side of the dunes that parallel the seashore. Most of the butterflies were at heights between three and fifteen feet from the ground. The locality and direction of this flight conform to the theory of Fernald (1937) that the migrations of this species are toward the east from somewhere west of New Smyrna, dividing at the seashore to follow the east coast northward and southward.

Phoebis eubule Linn.

Southward migrations of *Phoebis eubule* occur in Missouri every autumn, the density of the migrating populations varying considerably from year to year. In 1938 I noticed the movement on nearly every day from August 25 to September 3 at Webster Groves, Missouri, although the flight was evidently in progress before and after this period. No butterflies were seen on a few cloudy and rainy days; but on bright days during the usual hours of butterfly activity, there was hardly a minute when one or more could not be seen flying a little to the east of a due southerly direction. Many stopped momentarily at flowers to feed, but quickly resumed their flight to the south.

At Urbana, Illinois, no migrating butterflies of this species were seen in 1938 up to the time of my departure from there on August 12, nor after my return on September 4 through the remainder of September and October, although the flights usually continue during this period in Missouri (O'Byrne, 1933; Brower, 1930). In view of the large number of migrants seen near the eastern boundary of Missouri, the absence of a similar movement in eastern Illinois at nearly the same time indicates that the area or lane in which migration occurs has its eastern edge somewhere in the state of Illinois, or at the Mississippi river. No migrations in Illinois are included in the table in which Williams (1938, fig. 6, p. 229) has summarized all the recorded flights of this species.

Of the instances mentioned above, the true migratory nature of the annual flights of *Danaus plexippus,* in which the same individuals make a return flight, has been fairly well established. The specimens of *Phyciodes picta* captured in eastern Missouri, in the absence of observations of flights in progress, are probably best regarded as individual strays outside the usual range of the species. The frequent movements of *Ascia monuste* in Florida and *Phoebis eubule* in the Mississippi valley are properly described as emigrations, since there is no evidence that any of the butterflies that take part in these flights, nor their offspring, ever return to the regions where the flights originate. Williams (1938), however, gives evidence for a northward spring flight of *Phoebis eubule* in Alabama and Georgia, though such movements have not been reported in other areas. But attempts to classify migrations can be only tentative until adequate information is available on the place and manner of hibernation, condition of gonads at the time of migration, climatic and weather conditions at the start of the flight, and what happens at the end of the flight.

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DESCRIPTION OF AN INSECT CONTAINER FOR A TRAPLIGHT.

By Chas. H. Martin, Ohio Agricultural Experiment Station,
Wooster, Ohio.

While operating a series of traplights for the Tomato Fruit Worm (*Heliothis obsoleta* Fabr.) Project of the Ohio Agricultural Experiment Station at Marietta, Ohio, the writer had the experience of sometimes capturing nearly 3 pounds of insects at some of the traps[1] in one night. Most of these insects were the caddis fly *Potomyia flava* Hagen.[2] Of course, ordinary 2-quart jars were not adequate for such captures. Also, when any quantity of insects was trapped in the cyanide jars there was a very poor kill and specimens were battered so that they could not be identified.

De Gryse[3] used a water-pail container instead of a cyanide jar. However, this type is complex to make and specimens are apt to become wet in it.

At Marietta the cyanide jars were replaced by 50-pound lard cans charged with carbon bisulfide. The can was equipped as follows: A chute for connecting it with the trap hopper was made from a cylinder of tin 2½ inches in diameter and about 8 inches long. This was fitted into a hole in the center of the lard can lid which was made by cutting a circular area the diameter of the chute into triangular segments and bending them upward at right angles to the lid surface (A, fig. 1). The cylinder was pushed upward through the hole thus made so that it projected ½ inch above the lid surface (B, fig. 1). The triangular segments of the lid were secured to the cylinder by means of nail holes punched through the two metal surfaces. Finally, to prevent the cylinder from slipping, a piece of baling wire (C, fig. 1) was inserted through opposite holes and the ends bent against the cylinder. Thus, a collar was formed which projected upward into the flange (D, fig. 1) of the trap hopper.

The lower portion of the cylinder projecting into the can was bent so that the insects fell into the container through an elbowed chute. This was done to prevent them from flying back out of the can to the light, as they sometimes did from cyanide jars.

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[1] At mercury vapor H-4 and S-4 lamps furnished by L. C. Porter of the General Electric Company, Cleveland, Ohio.

[2] Determined by H. H. Ross, Illinois State Natural History Survey.

[3] De Gryse, J. J. 1934. Note on a new light trap. Sixty-fourth annual report of the Entomological Society of Ontario. 55–57. illus.

The elbow was made by cutting two parallel slits (E, fig. 1) $\frac{1}{2}$ inch apart on opposite sides of the cylinder, and about 2 inches was trimmed off the ends of the resulting narrow strips. The edges of the larger strips (F & G, fig. 1) were notched so that these sections could be bent parallel in a curve until the lower one extended across and beyond the mouth of the cylinder.

A waterspout elbow might be used as a chute.

A piece of $\frac{1}{2}$-inch mesh hardware cloth (I, fig. 1) was placed on baling wire supports (H, fig. 1) about halfway between the top and bottom of the can. This separated the larger insects from the smaller ones, which fell through the wire to the bottom of the can, and prevented the former from battering the latter. Crumpled newspaper was placed beneath the hardware cloth to absorb the moisture which might condense in the can and damage the insects on the bottom.

The carbon bisulfide was contained in a small tin can (J, fig. 1) which was wired to the side of the lard can, near the lid. This position ensured a high concentration of gas near the top as well as at the bottom of the lard can.

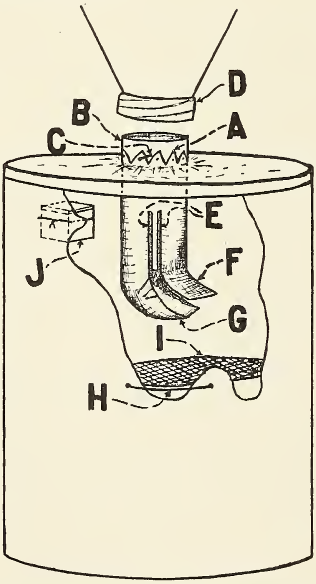

FIG. 1. The details of an insect container for a traplight.

The apparatus was charged each evening by pouring about 100 cc. of carbon bisulfide over a loose wad of cotton in the small tin can. A loosely fitting lid with four holes punched in it was put on the carbon bisulfide can to ensure a slow escape of gas.

The container was set under the trap on a platform nailed to the light pole at the proper distance from the ground.

This type of a killing vessel was cheaply made and simple to operate. All the specimens caught in it could be identified and many perfect ones were obtained. The placing of crumpled newspaper on the bottom of the can is necessary to ensure good results.

A NEW LOXANDRUS (COLEOPTERA, CARABIDAE) FROM CINCINNATI OHIO.

By Joseph F. Wright, Cincinnati, Ohio.

Loxandrus duryi sp. nov.

Above black, strongly shining; elytra also strongly iridescent and with a medium sized rounded, sutural, rufous spot near the apex varying in extent over the posterior fourth to the posterior third of the elytra; thorax slightly rufescent along the middle one third of the basal margin; labrum and mandibles dark reddish brown; antennae dark brown, the tips of the joints more fuscous with the three basal joints being paler. Body beneath piceous, the coxae dark reddish brown, the legs pale brown throughout. Generally moderately convex, elongate and narrow. Head two thirds as wide as the thorax, not elongate, eyes very prominent. Thorax one third wider than long (♀), one fourth wider than long (♂), the sides regularly but moderately curved from base to apex, with the lateral margins narrowly reflexed and somewhat translucent basally; thorax as wide in front as behind, the front angles slightly rounded, the hind ones obtuse; apex not sinuate, the base finely margined on its lateral thirds; median line punctate, obsolete on basal fourth; pronotal foveae deep, narrow, attaining the base and sparsely but distinctly punctate, the punctures extending medially and laterally from the base of the foveae. Elytra one third wider than thorax, the humeral angles rounded, more so in the ♀; almost parallel, very gradually and evenly rounded to the apical third, then more acutely graduated to apex. Striae heavily impressed (♀), moderately so (♂), the seventh obsolete basally; intervals moderately convex. Length ♂ 7.2 mm and ♀ 7.5 mm; width, ♂ 2.9 mm and ♀ 2.9 mm.

Named in honor of Ralph Dury, naturalist son of the late Charles Dury and described from a series of 43 specimens all taken near Goshen, Ohio, in Clermont County. Ten specimens (4 ♂, 6 ♀) were sent to the United States National Museum and four (2 ♂, 2 ♀) specimens have been deposited in the Dury collection at the Cincinnati Museum of Natural History. Holotype male and female are in my collection.

The species closely resembles *L. vulneratus Casey* but is easily distinguished from that species by the coarser punctures in the elytral striae, deeper and punctured pronotal foveae, and also by the presence of punctures in the region of the pronotal foveae (foveal and near-foveal punctures are absent in *vulneratus Casey*); the elytra are much more strongly iridescent and the species in general is larger than *vulneratus Casey*. The average length and width of the 43 specimens was 7.2 mm and 2.8 mm respectively. The extreme length and width of the 43 specimens was 8.0 mm and 6.5 mm (lengths), 3.0 mm and 2.4 mm (widths).

The specimens were collected under the half dried up algae of a spring pond; which, having dried up, left the algae as a thick mat over the rich dirt bottom. Underneath this mat the ground was still very damp and the specimens were taken in abundance. The pond was situated at the edge of a mesophytic forest on the high tableland of Clermont County, Ohio.

Centris in Colorado.—*Centris* is a genus of large and handsome bees, with very many species in the Neotropical Region. Several species occur near the southwestern border of the United States, from Texas to Southern California. I should have been prepared to assert that the genus did not occur in Colorado; but recently I have examined a male *Centris caesalpiniae* Ckll., taken by H. Rodeck and M. James, south of Lamport, Colorado, Aug. 2, 1933.—T. D. A. Cockerell, Boulder, Colo.

Abedus (Hemiptera—Belostomatidae) Eaten by Raccoon.—At the Circle Z Ranch, near Patagonia, Arizona, on October 1, my son Richard de la Torre-Bueno observed a tame raccoon (*Procyon lotor*) catching and eating various insects. It also fished in streamlet and there it caught and ate an egg-laden male *Abedus*.—J. R. de la Torre-Bueno, Tucson, Ariz.

BRENTHIS APHIRAPE (HUEBNER) IN NORTH AMERICA, WITH A NEW RECORD OF THE SPECIES FROM MAINE (LEPIDOPTERA, NYMPHALIDAE).

By Alexander B. Klots, College of the City of New York,
New York, N. Y.

On July 7, 1937, a worn specimen of *Brenthis aphirape* was taken by Mr. L. P. Grey on the "tableland" of Mt. Katahdin, Maine. The specimen was acquired by Mr. Cyril dos Passos, who asked my opinion of it. Since one specimen was obviously insufficient for any taxonomic conclusions, we determined to try to get more. It was my opinion that if *aphirape* were really established in the vicinity of Katahdin, it would be found in a high, cold, acid-bog habitat. The topographic map shows the presence of a large bog called the "Klondike" at 2800–2900 ft. elevation just to the northwest of the main mountain mass; and we determined to try here.

On June 28, 1928, Mr. dos Passos, Dr. J. J. Copeland (botanist at the College of the City of New York) and I began attempting to reach the Klondike. There are no trails; and the country is very rough and heavily timbered. Fortunately we hit the best route on the first try. This is to follow a landslide up the west side of Mt. Coe (sp?) from the Sourdnahunk Tote Road. Mt. Coe lies just west of the Klondike, and is not shown on the topographic map for the area (Katahdin quad.); it is the most western of the high points in the ridge that bounds the Klondike on the Northwest, West and South. In this ridge Mt. Coe lies between South Brother (alt. about 3800 ft.) and Barren Mt. (3681 ft.).

After climbing to its summit, we descended the east side of Mt. Coe into the Klondike. By this time the weather was cloudy, so that no butterflies were seen; but a good series of *Crambus labradoriensis* Christoph (*Pyralididae*) was taken. On the next day (June 29) we returned, making better time over the now-known route, and favored with better weather. In accordance with our hopes we found the *Brenthis* present in considerable numbers, and took a series of 53 specimens in all. The majority of these were somewhat worn.

The Klondike.

The Klondike occupies a basin approximately $1\frac{1}{2} \times 1$ miles in extent. A number of streams empty into it much of the water from the western part of the Katahdin massif. These converge to form a single stream, of which the outlet from the basin is to the North-east. The floor of the basin is comparatively flat, so that the flow of this meandering stream is comparatively sluggish.

The vegetation of most of the basin-floor is of typical acid-bog type. Most of the area is covered by a thick growth of *Picea mariana* (black spruce) through which it is often very difficult to force one's way.

Along the stream are a few small areas of sphagnum-heath-meadow, of which the largest that we were able to investigate was no more than 200 yards in diameter. It is in these meadows that the *Brenthis* occur; and it is a reasonable assumption that it is here they are breeding.

The meadows are covered with a very thick growth of *Sphagnum,* in and up through which a considerable variety of acid-tolerant plants is growing. Most noticeable is the fact that the Black Spruce-Larch forest[1] is encroaching upon the meadow areas at a very considerable rate. Everywhere in the meadows one sees what appear to be spruce seedlings a few inches high; but close examination shows these to be the tops of small trees sometimes as much as 3 feet high that are mostly buried in the Sphagnum. The zone around the edges of the meadows shows a thick growth of spruce and larch gradually increasing in height to the forest proper.

The meadows probably originated as beaver ponds. We were unable to verify this through lack of time, although I thought that I could trace the outline of an old beaver dam at the lower end of one meadow. But the beaver have been mostly trapped off, and it is a question whether they will reestablish themselves in the Klondike to any great extent anyway, because of the comparative lack of deciduous-tree food. We saw a couple of beaver cuttings several years old, but no fresh sign.

I have no doubt that unless some such extraneous force intervenes, the Black Spruce will continue encroaching upon the meadow areas and will, in another generation or so, largely obliterate them.

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[1] Coniferous forest in general represents the climax; but this should not be applied to Black Spruce forest in particular. This tree apparently cannot stand competition with Red Spruce (*Picea rubra*), White Spruce (*P. glauca*) and Fir (*Abies balsamea*) in normal environments; but, being more acid-tolerant, can exist successfully in pure stands in such bog areas as the Klondike. Black Spruce forest is, therefore, to be regarded as either subclimax or as a penultimate sere of extremely long duration. Erosion, or the accumulation of a thick top layer of non-acid soil, may in time change conditions in the Klondike so that the Black Spruce will be replaced by the true climax coniferous forest.

This will almost certainly result in the extermination of the *Brenthis* in these areas. We do not know what is the food-plant of the *Brenthis* here; it may be Violet, or Willow, or something yet again. We saw neither of these plants in the meadow areas.

A few characteristic plants of the meadow areas are:[2]

Sphagnum sp.—abundant.
Chamaedaphne calyculata (L.) Moench.—Leatherleaf—abundant.
Ledum groenlandicum Oeder.—Labrador Tea—abundant; flowering.
Vaccinium oxycoccos L.—Small Cranberry—very common.
Kalmia polifolia Wang.—Pale Laurel—common.
Andromeda glaucophylla Link.—Bog Rosemary—very common.
Smilacina trifolia (L.) Desf.—Bog Solomon's Seal—common.
Drosera rotundifolia L. Round-leaved Sundew—rare.
Sarracenia purpurea L. Pitcher Plant—rare.
Carex panicea Linn. Sedge—abundant.
Carex pauciflora Lightf. Sedge—abundant.
Cetraria islandica (Linn.). Ac. Iceland "Moss"—uncommon.
Cladonia rangiferina (Linn.). Web. Reindeer "Moss"—common.

THE RACES OF *B. aphirape* IN NORTH AMERICA

Obviously the point of major taxonomic interest regarding these Katahdin *Brenthis* concerns their realtionship to the other *aphirape* populations in North America. However, the situation is complicated by the fact that we really understand very little at present about most of these. Accordingly I here present a short synopsis of the species in North America as a whole, as a base for comparison with the Katahdin material.

Three "races" are recognized at present:

(a) *triclaris* (Huebner)—*type locality* Labrador.
(b) *dawsoni* Barnes & McDunnough—*type locality* Hymers, Ont.
    (b–1) ? *nichollae* Barnes & Benjamin—*type locality* "Rocky Mountains" (of Canada?)
(c) *caelestis* (Hemming) (*alticola* Barnes & McDunnough)—*type locality* Hall Valley, Colo.

(a). *Triclaris* represents the truly Arctic population of the species. On the basis of 88 specimens which I have available for critical study (American Museum of Natural History, dos Passos and

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[2] I am indebted to Dr. Copeland for determination of most of the plants.

Klots collections) I would apply this name to the *aphirape* populations of Labrador, Churchill, Manitoba and Alaska; and probably also extreme northern Alberta and British Columbia (Atlin). I do not at present think that the application of any additional race names in the Arctic population is warranted. The Churchill specimens show considerably more similarity to *dawsoni* (see below) than do any of the others; but inasmuch as it is in Central Canada that we would most expect to find a continuous and gradual merging of the northern and southern populations, this does not seem surprising.

Triclaris may be briefly characterized, mainly with respect to *dawsoni,* as follows:

> *Upperside.* The ground-color averages a lighter yellow-brown than in *dawsoni.* The marginal lunules tend to be filled in less with fuscous clouding; the same is true of all the light areas. The dark markings are narrower and more clear-cut.
>
> *Fore-wings, underside.* The space in cells R_5 and M_1, between the irregular, dark median line and the row of submarginal spots, tends to be a lighter yellowish than the general ground color *basad* of the dark transverse mark that bisects it, as well as *distad* of this mark.
>
> *Hind-wings, underside.* The dark basal area and bands are an orange-brown, definitely lighter than the reddish-brown of *dawsoni.* The basal and submedian light spots and the marginal lunules are yellowish, less silvered than in *dawsoni.* The marginal lunules average a trifle larger than in *dawsoni.*.

(b). *dawsoni.* In my estimation *dawsoni* represents the south-*central* Canadian race, not merely the southern one. I have been able to study far too few specimens of it; these are: 1 paratype, Hymers, Ont.; 6 specimens, Sand Ridge, Manitoba; 2 specimens, Riding Mountains, Manitoba. In addition two paratypes are figured in Holland's Butterfly Book; and I have seen a considerable number of specimens in the Canadian National Collection and the U. S. National Museum but have not studied these critically in preparation of this paper.

As so delimited (*i.e.,* from central Manitoba eastward, and not as far north as Churchill, Man., or Labrador) *dawsoni* is a well-marked race. Its chief characteristics have been sufficiently summarized above, by comparison with *triclaris;* however, see below.

(b–1). *nichollae*?. In the northern regions there now remain for consideration the *aphirape* from the Canadian Rocky Mountain regions of southern and central Alberta and British Columbia. Of these I have critically studied 26 specimens. There is a great deal of individual variation among these, but on the whole they appear to segregate as a group intermediate between *triclaris* and *dawsoni*. They may be characterized as follows:

Upperside. The ground-color is a lighter brown than in *dawsoni*, but is often more "washed-out" and not as bright as in *triclaris*. The dark markings are narrower and more clear-cut than in *dawsoni*. Some specimens show as much fuscous clouding as in *dawsoni*.

Underside. On the fore-wings some specimens strongly resemble *triclaris*, others *dawsoni*. On the hind-wings the dark basal areas and transverse bands are of a dark, rather reddish brown, more like *dawsoni* than *triclaris;* the light basal spots and the submedian row of spots tend to be more silvery than in *triclaris*.

Evidently the specimens represent something of an intermediate condition between *triclaris* and *dawsoni;* but in this they do not agree with the Churchill specimens mentioned above which are also intermediate but differently. Whether or not this Canadian Rocky Mountain form is worthy of recognition as a distinct, named race is a matter of opinion, and probably always will be. At present I prefer to await the study of further material.

It is also a moot question whether or no the name *nichollae* Barnes and Benjamin should properly be applied here. The name was unfortunately based on a small series of specimens from the Oberthür collection bearing no other data than "Rocky Mountains," which is much too vague; and the characteristics cited for it by the authors do not apply well to the general population under discussion.

THE KATAHDIN *aphirape*.

A total of 53 specimens was taken in the Klondike; with the first (1937) specimen taken on the Tableland and two others taken there (30 June, 1938) by Mr. dos Passos and myself there are 56 specimens of the Katahdin *Brenthis* available for study. Unfortunately a considerable percentage of these is somewhat worn and therefore not entirely satisfactory material for critical study. However, the series as a whole may be characterized as follows:

Size.—averages definitely smaller (length of fore-wing about 2 mm. less) than either *triclaris* or *dawsoni*.

Upperside.—The general ground-color above, while dark, does not average as rich an orange-brown as in *dawsoni*. The black markings and fuscous cloudings are heavy, as in *dawsoni;* but a great many of the specimens tend to show irregular enlargements and fusions of these marks, *i.e.*, there is an abnormal percentage of abnormality in this respect.

Underside.—The markings and coloration of the fore-wings resemble those of *dawsoni*.

The silvering of the basal and submedian row of light spots of the hind-wing is pronounced as in *dawsoni*. The dark basal area and transverse bands are reddish-brown as in *dawsoni*. The postmedian yellowish band (just basad of the row of round spots) averages slightly lighter in tone, and is margined basally by a much more definite, narrow, diffuse shade of black scaling than in *dawsoni*. There seems to be a larger percentage of black scales mixed in with those of all other colors, so that the pattern is more diffuse looking, and the general tone dirtier.

On the whole the Katahdin specimens resemble *dawsoni* much more strongly than they do any other *aphirape* races; but *in series* they show definite differences from *dawsoni,* appearing in general smaller, darker, dirtier and somewhat more aberrational. On the basis of the material at present available for study I do not feel justified in applying a name; but I hope to obtain more specimens of the Kathadin *Brenthis* and of *dawsoni,* which may warrant a reconsideration of the situation.

A Word of Warning.

It is probable that other collectors will wish to visit the Klondike and obtain specimens there. I have accordingly given directions for reaching it by the easiest route; although with the admonishment that what with rock slides, blown-down timber and black-flies the trip is a fairly hard and miserable one at best.

May I enter a plea to any such collectors to exercise discretion as to the number of specimens that they collect. The total meadow area available for *aphirape* is very small, and is becoming smaller. We really felt a bit guilty at having taken as many as fifty-three specimens. As far as I know this colony of *aphirape* is the only representation of the species in the eastern United States; and it might well be exterminated by too much selfish collecting. It would be wise, therefore, for collectors to examine all specimens carefully before killing them, and to liberate unharmed all males that are not in really fine and fresh condition. The number of females retained should be kept to a minimum; and if the collector's conscience will stand the strain he should liberate all unworn females so that these may have opportunity to lay their eggs.

A NOTE ON MANTISPIDAE.

H. B. Hungerford, Lawrence, Kansas.

On October 8, 1938, Mr. Charles Shepard, one of my students, collected a spider at Hole-in-the-Rock, near Lawrence, Kansas. The spider was placed in 95% alcohol and upon later examination proved to be carrying some ten or fifteen first stage Mantispid larvae on the pedicel of the abdomen. Dr. W. J. Gertsch of the American Museum of Natural History has identified the spider as a female of *Arctosa littoralis* (Hentz), a species which he says "is common throughout the United States and is most usually found on beaches or banks of lakes and streams, ordinarily quite near water."

It has been only within the past five years that we have had any information on the biology of any North American Mantispid. Dr. R. C. Smith (1934) recorded the emergence of *Mantispa interrupta* from the egg sac of the jumping spider *Philaeus militaris* and gave some notes on the eggs and young larvae of *M. interrupta* Say, *M. sayi* Banks, and *C. brunnea* (Say). Hungerford (1936) gave additional information on the oviposition of *M. interrupta* Say and Kaston (1938) reported the emergence of *Mantispa fusicornis* Banks from the egg sac of *Agelena naevia* Walckenaer. In Kaston's record the spider was collected near Albion, Michigan, on September 17, and taken to New Haven, Connecticut, where about September 20 it deposited an egg sac in the glass container in which it was confined. On November 8 the adult Mantispa was found dead in the container. It had developed in the spider egg sac. Kaston gave two possibilities as to the source of the Mantispid. Either the larva crawled into the spider's cage at New Haven or was carried from Michigan, hidden among the hairs on the spider's body. In view of the observation I am reporting, it seems likely that the larva of the Mantispid traveled with the spider from Michigan, although this species of Mantispid has never been reported from so far north. Moreover, it suggests that had I made living female spiders available to some of the 36,000 larvae I had one season, instead of trying them on spider egg cases, I might have had some success in rearing the Mantispids.

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EDITORIAL.

Constant in Service.

With this number, the Bulletin of the Brooklyn Entomological Society completes its thirty-fourth volume, a continuous publication of 28 volumes in the 28 years since it was revived in 1912. It also rounds out the twenty-first year of the present Editor's service as such, and the 27th year since he was selected to our Publication Committee. His service is today the longest of any present editor of an American entomological journal.

In these 28 years the Brooklyn Entomological Society has consistently served entomology. Not alone has it continued, supported and improved the Bulletin, but it has also revived Entomologica Americana as a monographic journal. This is closing its 14th volume in active publication since 1926. The Society's two outstanding services to entomology have been the publication of Boving and Craighead's classic work on the larvae of Coleoptera, and the enlarged new Glossary of Entomology, a useful and needed volume.

Under present long-lasting adverse conditions, this represents a great achievement on the part of a Society officered and managed by non-professional entomologists, with the majority of its members amateurs, who pursue the study of entomology in their leisure time.

This small, and in its membership relatively inconspicuous Society has done what it has done under its own power. It has no subsidies and no outside aid of any kind; its only income is derived from membership dues and receipts from its publications. Yet, it is entirely solvent and its publications continue on what we fondly hope is a high plane.

We trust that these not unfavorable conditions will continue; but for their continuance we must rely, as always, on the constant and increased support of those outside the limited group of the Society, by their subscriptions to our publications. We appeal for this aid in good measure, to enable us to maintain these high standards and to continue this unremunerated service to entomology.

Self-praise is no recommendation. What we have here stated are bare unadorned facts, known to all entomologists. In their hands we confidently leave our future success, in which in the past they have been so valued an element.

The Publication Committee
of the Brooklyn Entomological Society.

PROCEEDINGS OF THE SOCIETY

Meeting of October 13, 1938.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, October 13, 1938. President William T. Davis presided, calling the meeting to order at 8:15 P.M. Eight other members were present, namely, Dr. Dietrich and Dr. Tulloch, and Messrs. Buchholz, Dietz, Engelhardt, Rau, Siepmann and Stecher; also Miss Dietz, Miss Harty, and Messrs. John J. Bowe, L. B. Cole, John Elfstrom and A. T. Gaul.

The minutes of the previous meeting were read and approved. Mr. Engelhardt, reporting as Treasurer, said that the Society's income since January 1, including balance brought forward from 1937, was $3078.69 and disbursements were $2648.41, leaving a balance of $430.28. The financial condition of the Society, he added, is even better than it was at the same time last year. He also read a communication from Mr. Torre-Bueno, in which a glossary of English entomological terms and their equivalent in other languages was suggested.

Dr. Davis exhibited a specimen of the large cicada, *Quesada gigas,* collected by Emmet S. Clauch, Jr., at Corpus Christi, Texas, and other specimens of that species. It is distributed from Brownsville, Texas southward to Argentina. Its song is a sort of a whistle, and the effect of a number of these cicadas singing close at hand is not unlike that of a locomotive whistle. Mr. Davis also showed cicadas collected by Mr. Harry Hoogstraal, of the University of Illionis, Urbana, Ill., and Dr. H. B. Parks, of the Stephen F. Austin State Teachers College at Nacogdoches, Texas.

Mr. Dietz reported that his collecting in the Bronx was rather poor this year. He showed a small glass-covered box containing several neatly spread Lepidoptera. It was of Japanese manufacture, and was bought locally for five cents, specimens included.

Dr. Dietrich said that the remainder of the Schaeffer collection of Coleoptera, which had not already gone to other collectors, and representing about 80 of the original 200 boxes, went to Cornell University, and will be incorporated with the college collection. About six holotypes are included in the material. Among the families represented are the Nitidulidae and the Ostomidae. A complete list will be published in a brief note in the Bulletin.

Mr. Rau exhibited a specimen of *Hyperaspis* (Coccinellidae) believed to be an undescribed species. Seven of the beetles were reared from twelve larvae found feeding on mealy bugs.

Mr. Buchholz reported collecting in the region between Wilmington, N. C., and Myrtle Beach, S. C., during the past summer.

Mr. Davis reported that nearly all the *Argynnis* were disappearing from Staten Island, as well as many other Lepidoptera. The *Argynnis* feed on violets. Mr. Buchholz added that the common *Cecropia* is also disappearing from this vicinity. In 1900 Mr. Kearfott took hundreds of their cocoons on maple at Elizabethport, N. J. Now the *Cecropia* is rarely found on maple, and almost the only place where you can get them is in the marshes.

Dr. Tulloch reported that he had been to Montana to study ticks and the spotted fever transmitted by them.

Mr. A. T. Gaul reported taking *Dolichovespula arctica* at Salisbury, Conn., which is a new record for that state.

Mr. Siepmann said that he was studying the North American Histeridae, and showed a specimen of the European *Hister purpurascens,* taken at Pittsburgh, Pa., as well as several specimens of the same species from Europe. He said that the descriptions of many of our Histeridae, even common species, have been drawn up from relatively scanty material, with the result that the characters proposed for their separation do not hold constant when additional material is taken into consideration. The synoptic tables in particular, which are generally employed by those who seek to identify their material, are often based upon characters which have little or no taxonomic value. Authors too frequently have drawn up their synoptic tables from the existing literature rather than from a careful examination of specimens. In consequence Histeridae are often misidentified, even in the collections of well-known taxonomists.

The meeting adjourned at 10:00 P.M.

Carl G. Siepmann,
Secretary.

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DEJEAN CATALOGUE NAMES (COLEOPTERA).

By H. S. Barber and J. C. Bridwell, Washington, D. C.

The present note is intended to clarify ideas on validity, authorship and date of many familiar generic names in Chrysomelidae which, under the International Code of Zoological Nomenclature, appear to be valid in the Dejean catalogues. Most of these names are believed to date from early in 1837 as explained below, but are incorrectly cited as of 1835 in the new Nomenclator Zoologicus by S. A. Neave and are there regarded as *nomina nuda.* This date, 1835, is also ascribed to them in the yet unfinished Nomenclator Animalium (Schulze, Berlin 1926–1938) where their treatment as to validity is variable. In contrast to the rejection of the Dejean Catalogue names one encounters the unquestioned adoption of similarly proposed names from the Billberg Catalogue. Many are averse to the consideration of these names, perhaps through mere misunderstanding of the motives which produced them and of the manner in which they have come into use. Examinations of certain cases show misapplications demanding correction of names applied to a few well known species in our fauna, as well as the renaming of two neotropical genera.

We are convinced that increase in knowledge of Coleoptera has been influenced more by the Dejean Catalogue than by any other single volume known to us. It stood for half a century as the "bible" of the coleopterist. Names taken from it were used in good faith by almost all workers. Then arose a concept of generic validity under which these names were claimed to be of no significance because characterizations were not given and, on this assumption, some of these names were freely used for other genera. The conflict of names resulting contrasts strongly with the constructive work of the great builders of our system who adopted these names in their original applications and whose results usually agree well with those attainable now by a strict and impersonal application of

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the rules of the International Code. If as is customary we recognize a generic name as established by designation of a known species as its genotype or if a name became valid[1] by mere mention of the names of the species to be included, there should be no objection to new generic names proposed in this catalogue for listed species accompanied by bibliographical citation to prior descriptions. The author name following the specific name in the Dejean Catalogue is such a bibliograpical citation and, except in rare cases, there can be no doubt as to which old species are included in the new genera.

In each case where the new generic name covers only specific *nomina nuda,* the generic name should be considered a *nomen nudum,* available for free use by a subsequent author, and in such cases we believe these later contributors have usually applied the name in the identical sense as in the Dejean collection, which was the basis of the catalogue. On the other hand, new generic names followed by included valid specific names with cited abbreviation of author, should be regarded as valid and the application of each determined by selection of an included valid species as genotype. Even the *nomina nuda* from Dejean were listed as valid in Agassiz and Erichson 1846 (Nomenclator Zoologicus, Coleoptera).

The last *livraison* of that edition of the Dejean Catalogue which usually bears a title page date 1833 has not been satisfactorily explained and dated. It is generally known that the earlier parts appeared in 1833, 1834 and 1835 as separate fascicles in covers numbered 1 to 4. The last or fifth part, in which most of these chrysomelid names appear, was not issued up to the time of the great fire of December 12, 1835 (Ann. Soc. Ent. France, vol. 4, p. XC), which destroyed all of the undistributed edition and an appalling number of other French works on insects. Yet there are in numerous libraries apparently complete copies with title page date 1833 and including part 5. The reason for their existence we can now explain.

Announcement by Dejean that publication of this fifth part has been delayed and that a new edition of the burned catalogue has been started appears after February 15, 1836 (Ann. Soc. Ent. France, vol. 4, p. cxxii). A later announcement (*l. c.,* vol. 5, p. xiv) after October 1836 mentions part 5 as in press. It was finally presented at the meeting of July 5, 1837. According to our investigations this part consists of pages 361–442 of the volumes bearing title-page date 1833, and pages 385–466 in the last edition with title-page date 1837, or rarely 1836. If, as has been done by the writers, several copies of these two editions of the Dejean catalogues be assembled and compared,[2] it will be found that every

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[1] Prior to Jan. 1, 1931, when Article 25c of the Code became effective.

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[2] Explanations of the Dejean catalogues by Boisduval 1845 (Ann. Soc. Ent. France, ser. 2, vol. 3, pp. 501, 504, 509), Hagen 1862 (Bibliotheca Entomologica, p. 165), Kraatz 1874 (Berlin. Ent. Ztschr., vol. 18, p. 212), Sherborn 1922 (Index Animalium II, p. xlii) Griffin 1932 (Ann. and Mag. Nat. Hist., ser. 10, vol. 9, p. 178) and Schenkling 1932 (Wiener. Ent. Ztschr., vol. 49, p. 309) disagree greatly and we are unable to apply any of these interpretations *in toto* to the several copies we have studied. The blue temporary covers of the four fascicles of the "1833" edition appear to have been used indifferently in the filling of orders up to the burning of the entire undistributed stock in December 1835. Book dealers may, even since then, have exchanged parts and covers. If, as we believe, different title-pages were issued with part 1 in 1836 and part 5 in 1837 and the binder discarded the wrong one, Griffin's 5 editions and other errors in Hagen and in Kraatz may be understood. Our guess is that an 1836 title-page appeared with the first part of the "Troisième Édition," the fifth part of which was unexpectedly delayed until after April 1837 and that a new title-page accompanied the *Avertissement* (pp. v–xiv), *Recapitulation* (p. 467), *Table Alphabetique* (pp. 469–499) and *Errata* (pp. 500–503) which were issued with Fascicle 5 prior to July 5, 1837. Replacement of a missing or damaged title-page of the 1833 edition with a spare title-page of the 1836 edition may account for edition 4 in the Griffin interpretation. Such a title-page is bound in a copy (Casey library) which is otherwise identical with the usual 1837 edition.

Postscript—Schenkling's account (1932 above inserted) of these catalogues was unnoticed by us until after the present paper was in the printer's hands. It requires no change in our results and appears to be correct except in two details: The inference that Dejean had been lax in citing his catalogues, and the claim, in agreement with Griffin 1932, of a separate 1836 edition. Dejean never cited his first list (1802) as his first edition but in his 1833 and 1837 volumes cites his 1821 volume as "Dej. Cat." and, in the 1837 volume, cites the 1833 volume as "Dej. Cat. 2." Subsequent works seem to cite these three volumes consistently as editions I, II and III until Hagen listed the 1802 pamphlet as the first edition and considered the "troisieme" edition as the fourth. This beginner's catalogue of 1802 merely lists the species which Dejean was able to item, and each broken or malformed character in the typography of these pages appears identical in the editions having title-page dates 1833, 1836 and 1837, except the numerals indicating pagination and signature. The writers are convinced that the publication and issuance of pages 385–466 as part 5 for addition to the four parts distributed in 1833 to 1835 was from the exact forms from which the "Troisième Édition" was published in 1837 and is of that date, the pagination, signature, and recapitulation, p. 443, being necessarily changed. Boisduval 1845 (Ann. Soc. Ent. France, ser. 2, vol. 3, p. 509) mentions the fourth and last part, but the announcements (*l. c.*, 1837, vol. 6, Bul. p. XIV, and p. LIII.) indicate that the 1837 edition appeared in five parts as was intended for the volume with title-page date 1833. Identity of part 5 in the "1833" and 1837 editions is proven by identity of typography alone, but Boisduval also states this fact. Its date must be between the meetings of the society of March 1 and July 5, 1837. April 1837 is the date of the introduction signed by Dejean.

Some confusing duplication appears in copies of the "1833" edition thus completed. Attention is especially called to p. 361, which is identical with p. 385 of the 1837 volume. In the latter it is plain that the 31 species listed in column 1 are part of the 40 species of *Megalopus* which also appear on p. 358 of the "1833" volume, except that *bicolor* Klug has been added. These 31 specific names seem thereby to have been included in the genus *Alurnus*, but the species have no affinity with that genus. It should also be of interest that *Lema* appears on pp. 359–360 with 97 species and again on pp. 362–363 with 102 species, an increase of 5 species between 1835 and 1837, the respective dates of parts 4 and 5. Five other genera are similarly repeated on pp. 361–363 of the 1837 part in the "1833" edition.

In the introduction (p. xiii) to the third, or 1837, edition (no introduction or index appeared for the 1833 edition) responsibility is given to Chevrolat for all of the genera which he has proposed out of the ancient great genera *Hispa, Cassida, Galeruca, Altica, Chrysomela, Colaspis, Eumolpus, Clythra, Cryptocephalus,* etc. This statement not only fixes Chevrolat as author of most of the new generic names but definitely connects most of the species included in the new genera with their prior generic positions, which is apparent, however, to anyone familiar with the then available

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identify from the just published Fabrician volumes. It marks the beginning (when Dejean was 22) of his career as the great harmonizer of his entomological colleagues and of their views on classification.

literature even were the introductory statement not considered. Thus Chevrolat's great reclassification of Chrysomelidae considers 301 genera, of which 66 are ascribed to Dejean, 189 to Chevrolat, and 46 others to 16 other authors.

Genotype designations for thirty-one genera of cassidids were published in 1842 (Duponchel and Chevrolat in D'Orbigny, Dict. Univ. Hist. Nat., vol. 3, p. 210), but these have been ignored for almost a century. Some of them, as well as some of the indicated synonymy then offered, are admittedly invalid but most are acceptable and are explanatory of a long continued divergence in the application of the names. The correct analysis of old contributions, as to both nomenclature and zoology, and their accurate cataloguing is indispensable to revisional studies. These aspects of the nomenclature of the cassidids are, unfortunately, not considered in the admirable contribution on generic limitations by Spaeth 1913 (Archiv f. Naturgesch., vol. 79, A, heft 6, pp. 126–164), and it is suggested below that several of the generic names therein adopted are now to be cited in synonymy.

A list of these chrysomelid genera with their genotypes has been contemplated, but accurate determination of the latter requires such extensive search through literature that its completion has not been possible. Numerous genotypes are established by Duponchel and Chevrolat, or by others in subsequent papers, and recent arbitrary selections are often erroneous as in the case of *Deloyala,* mentioned below. A few examples from the many cases examined are offered in illustration of the diverse problems encountered. We believe that stability of nomenclature is possible only by impersonal application of rules and that the International Code is the only basis for procedure which we can follow, since its rules were unanimously agreed upon by a properly constituted and authorized international body.

Haemonia "Megerle" Dejean 1835 ("1833" ed. p. 357), 1836 ("1837" ed. p. 384) attained validity in Dejean 1821 (p. 114), where it is based upon *equisetae* F. and *zosterae* F. *Apelma* Billberg 1820[3] and *Macroplea* Samouelle 1819 are established on the same two species in virtually the same manner. Curtis 1830 and Westwood 1840 have designated *Donacia zosterae* F. the genotype of *Macroplea* which, being prior, is to be adopted. The three generic names are isogenotypic synonyms by present designation of *D. zosterae* F. as genotype of *Haemonia* and *Apelma.*

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[3] Citation to author being often not attached to the specific names in Billberg 1820, the validity of his new generic names seemed questionable until it was found that the numerals "1.3.98" under *Apelma* are the bibliographical citation to Schoenherr 1817 (Synonymia Insectorum, vol. 1, pt. 3, p. 98) where the bibliography of *Donacia zosterae* F. is given. In other cases investigated, the dash (—), when used under habitat or page numeral, is equivalent to ditto.

Megascelis Dej. appears as a *nomen nudum* on p. 114 of the 1821 edition of the Dejean Catalogue, and reappears in the 1833 edition on p. 358 which was published in 1835 and on p. 361 which was published in 1837 (this being identical with p. 385 of volumes with title-page dates 1836 or 1837), each of the latter including valid specific names. Clavareau 1913 (Coleop. Cat. Junk, pt. 58, p. 3) ascribes the name to Latreille 1829 where valid species are also included, but the name attained validity in Sturm 1826 (Cat. meiner Ins. Samml., p. 80, tab. 4, fig. 36) where *Megascelis aenea* is described and figured and is to be considered the genotype. Lacordaire 1845 (Monog. Coleop. Phyt., pt. 1, p. 254) explicitly cites Sturm, but Clavareau has omitted these citations.

Gastrophysa Chev. 1837 (pp. 405, 429) is valid as stated in Chapuis 1874 (Gen. Coleop., vol. 10, p. 371). Its genotype, *Chrysomela polygoni* F., designated by Chevrolat 1846 (D'Orbigny, Dict. Univ. Hist. Nat., vol. 6, p. 34) is also that of *Gastroeidea* Hope 1840 by original designation and of *Gastroidea* G. & H. 1874.

Anisodera Chev. 1837 (pp. 363, 387). The result attained by Maulik 1916 (Zool. Soc. London, Proc. 1916, pp. 569–570) is not altered by acceptance of the Dejean Catalogue. The originally fixed genotype is *Alurnus ferruginea* F. 1801 and not *A. excavata* as designated by Baly 1859.

Callistola Dejean 1837 (pp. 363, 387) is valid and monobasic, *Hispa speciosa* Boisduval 1835 being its genotype as stated by Guérin 1840 (Rev. Zool., 1840, p. 333) and by Duponchel 1842 (D'Orbigny, Dict. Univ. Hist. Nat., vol. 3, p. 59); "d'Urville" is a bibliographical citation. This species (*speciosa*) is listed by Weiss 1911 (Coleop. Cat. Junk, pt. 35, p. 47) under *Oxycephala* Guérin wrongly supposed to be valid in 1830, but the cited volume (Duperrey, Voyage—Coquille, Zool., vol. 2, pt. 2, div. 1, p. 142) is now believed to have been published about the end of 1838. An uncatalogued earlier validation of *Oxycephala cornigera* Guérin 1835 (Icon. Règne Anim. Ins.,

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These bibliographical citations are acceptable as "indications" conferring validity upon the new generic names.

pl. 48, fig. 2) established priority of the latter monobasic genonym.

Sceloenopla Chev. 1837 (pp. 364, 388), genotype *Hispa spinipes* F. 1794, designated by Baly 1859, is valid and has been adopted by Uhmann 1937 (Mitt. Zool. Mus. Berlin, vol. 22, pp. 204–212) to suppress *Cephalodonta* Baly 1859 which is isogenotypic by original designation and includes also *Microdonta*, mentioned below.

Cephalodonta, a *nomen nudum* in Dejean 1837 (pp. 364, 388) and so cited by Neave 1939, becomes valid in Chevrolat 1842 (D'Orbigny, Dict. Univ. Hist. Nat., vol. 3, p. 272) where *Chalepus goniapterus* Perty becomes its genotype. Neave 1939 cites validation by Guérin 1844, but the above mentioned genotype is there placed doubtfully in *Uroplata* instead of in the heterogeneous aggregate under *Cephalodonta*.

Microdonta Chev. 1837 (pp. 364, 388), genotype *Hispa serraticornis* F. designated by Chevrolat 1846 (D'Orbigny, Dict. Univ. Hist. Nat., vol. 8, p. 197) conflicts with the scarabaeid genus proposed by Hope 1837 (Coleop. Manual, pt. 1, p. 105) but has been merged with *Sceloenopla* as above mentioned.

Notosacantha Chev. 1837 (pp. 367, 391), monobasic, genotype *Cassida echinata* F., also designated by Duponchel and Chevrolat 1842 (D'Orbigny, Dict. Univ. Hist. Nat., vol. 3, p. 210). An unsigned item in the same work 1846 (vol. 8, p. 677) mentions this genonym as synonym of *Hoplionota* Hope, but current use of the latter is to be discontinued because it is a subsequent isogenotypic synonym.

Thyreomorpha Dejean 1837 (pp. 367, 391) is a *nomen nudum* and does not become valid in either Duponchel and Chevrolat 1842 or in Chevrolat 1849 (D'Orbigny, Dict. Univ. Hist. Nat., vol. 12, p. 570). It attains monobasic validity by citation in synonymy in Boheman 1850 (p. 35) under *Hoplionota badia* Boh. its genotype.

Imatidium F. 1801 accepted in Chevrolat 1837 (pp. 367, 391), genotype *I. thoracicum* F., designation by Latreille 1810 (p. 432). Subsequent designation by Hope 1840, *I. trimaculatum* F. Subsequent designation in Duponchel and Chevrolat 1842 *I. fasciatum* F. Spaeth 1938 (Rev. de Ent., Rio de Janeiro, vol. 9, p. 305) mentions the latter, *fasciatum* F. (=*capense* Hbst.) as the genotype. Malaise 1938 (Ent. Tidskr., vol. 59, p. 99–106) advances the belief that Fabricius indicated types of genera by detailed and extended descriptions of selected species and if this were acceptable Hope's genotype selection would stand, suppressing *Spilophora* Boh. and leaving *Imatidium* as we know the genus, without a name. Under the Code the first acceptable designation is by Latreille. *Himatidium* Illiger 1804 (Mag. f. Insectenkunde, vol. 3, p. 131) is accompanied by characterization, comments and specific mention, drawn from *Cassida bicornis, taurus* and *bidens* and might, for these reasons, supersede *Tauroma* Hope and *Omocerus* Chev. But it is best to regard it as an unnecessary emendation and misapplication of *Imatidium* F. under which it should be suppressed as isogenotypic because an allusion to Fabricius appears in the remarks. *Himatidium* Illiger (part) must, however, be cited in synonymy under *Omocerus.*

Calliaspis Dejean 1837 (pp. 367, 391), genotype *Cassida rubra* Oliv. 1808, designated in Duponchel 1842 (D'Orbigny, Dict. Univ. Hist. Nat., vol. 3, p. 50, 210).

Calyptocephala Chev. 1837 (pp. 367, 391), genotype *Cassida nigricornis* Germ. 1824, present designation. The genotype designation in Duponchel and Chevrolat 1842 may be rejected, *trigemina* being then still undescribed. This would permit continuance of the Boheman, Chapuis, Spaeth application of the genonym.

Omocera Chev. 1837 (pp. 367, 391) is a synonym of *Omocerus* Chev. 1835 (Coléoptères du Mexique, No. 119). Genotype, *Cassida bicornis* F. designated by Duponchel and Chevrolat 1842 (D'Orbigny, Dict. Univ. Hist. Nat., vol. 3, p. 211) citing, in synonymy, *Tauroma,* the originally designated genotype of which is *C. taurus.* Both of these genotypes, having been the basis of an overlooked generic concept by Illiger, a citation of *Himatidium* Illiger 1804 (part) should be catalogued in the generic synonymy.

Polychalca Chev. 1837 (pp. 368, 392) is valid. Genotype, *Cassida variolosa* F. 1801 (not Oliv. 1790) designated by Duponchel and Chevrolat 1842 (D'Orbigny, Dict. Univ. Hist. Nat., vol. 3, p. 211). *Pilidonota* Spaeth 1913 is isogenotypic by original designation. Being a primary homonym, *variolosa* should be suppressed as the name of this well known ornamental, used in jewelry, and the next available synonym, apparently *Cassida punctatissima* Wolf 1818 according to Spaeth 1914, should be adopted. *Desmonota* Hope 1839, genotype *Cassida platynota* Germ. 1824, by original designation, may be a subgenus of *Polychalca* Chev. (not Weise 1900). *Polychalca* Weise 1900 (Deut. Ent. Ztschr., vol. 44, p. 460) (not Chev.), invalid either as a homonym or because its designated genotype, *Cassida multicava* Latr. 1811, was assigned in another genus, *Cyrtonota* Chev., includes 16 species catalogued in Spaeth 1914. No available substitute name being known to us we propose a new genonym, *Polychalma,* (etym. nul.) for the same genotype.

(**Polychalma** new name, *ante,* for *Polychalca* Weise 1900, not *Polychalca* Chev. 1837; genotype, *Cassida multicava* Latr. 1811 by present designation, the genotype designation by Weise 1900 being either an emendation or a *lapsus calami.*)

Discomorpha Chev. 1837 (pp. 368, 392), genotype *Cassida variegata* F., designated in Duponchel and Chevrolat 1842 (D'Orbigny, Dict. Univ. Hist. Nat., vol. 3, p. 211), suppresses *Oxynodera* Hope 1840 and *Bia* Weise 1896 (twice preoccupied) as isogenotypic synonyms. Another species, *D. palliata* (F.) = *longicornis* Guérin (Fabr. in error) is the genotype of the hitherto uncatalogued, monobasic generic name *Cyclosoma* Guérin 1835 (Icon. Règne Anim. Ins., pl. 48, fig. 5). This genonym is validated in the legend on the plate which is of prior date to the comments on p. 288 of the "Texte Insectes," 1844. Unfortunately this suppresses *Prenea* Spaeth 1913 which was proposed for *palliata* and nine other species. The exact date of *Cyclosoma* Guérin is unknown but the 111 plates of insects were announced as finished in 1835 (Bul. Zool., 1835, première section, p. 71, 72).

Eugenysa Chev. 1837 (pp. 368, 392), genotype *Cassida grossa* F., designated by Duponchel and Chevrolat 1842 (D'Orbigny, Dict. Univ. Hist. Nat., vol. 3, p. 211). *Calaspis* Hope 1840 and *Calaspidia* Hope 1840 are isogenotypic synonyms by original designation.

Cyrtonota Chev. 1837 (pp. 368, 392) is valid. Duponchel and Chevrolet 1842 (D'Orbigny, Dict. Univ. Hist. Nat., vol. 3, p. 211) designate *Cassida lateralis* F. as its genotype. This species is originally included in *Neomphalia* Spaeth 1913 (Arch. f. Naturgesch., vol. 79, A, Heft 6, p. 131) and is its genotype by present designation. Among other valid specific names in *Cyrtonota* are: The originally designated genotype of *Mesomphalia* Hope, a species now catalogued in *Zatrephina* Spaeth, another now in *Polychalca* Weise (not Chev.), and ten others now in *Pseudomesomphalia* Spaeth. No type having been fixed for the latter genonym, we now designate *Cassida discors* F. its genotype. This is originally included by Spaeth's definition and remarks although not one of the few species mentioned by name in the brief comparisons of his new species. It is also one of five valid names included in *Pseudomesomphalia* and in *Stolas* Billberg 1820 and it is, by present designation, the genotype of the latter. *Pseudomesomphalia* Spaeth 1901 becomes therefore a synonym of *Stolas* Billberg 1820.

Dorynota Chev. 1837 (pp. 370, 394), genotype *Cassida bidens* F., designated by Duponchel and Chevrolat 1842 (D'Orbigny, Dict. Univ. Hist. Nat., vol. 3, p. 211) citing, in synonymy, *Batonota* Hope 1839, which is isogenotypic.

Acromis Chev. 1837 (pp. 370, 394), monobasic, genotype *Cassida spinifex* F., a listed synonym of which *C. perforata* F., is the genotype of *Selenis* Hope 1839. The latter is thus superseded as was shown by Duponchel and Chevrolat 1842.

Omaspides Chev. 1837 (pp. 371, 395), genotype *Cassida transversa* F., designated in Hope 1840 (Coleop. Manual, pt. 3, p. 158) and in Duponchel and Chevrolat 1842. The genonym is ascribed to Boheman 1854 in Spaeth 1914 where *clathrata* L. (a prior synonym of *transversa*) is cited as type.

Deloyala Chev. 1837 (pp. 371, 395) is valid. Its genotype, designated by Duponchel and Chevrolat 1842 (D'Orbigny, Dict. Univ. Hist. Nat., vol. 3, p. 211) is *Cassida crux* F. *Chirida* Chapuis 1875, genotype *C. cruciata* L., designated by Weise 1896, falls as synonym of *Deloyala,* their genotypes being listed as conspecific. This old and overlooked designation makes the designation of *Cassida clavata* F. by Barber 1916 ineffective and permits the assignment of this species by Spaeth 1937 in his new subgenus where it appears as *Plagiometriona* (*Parametriona*) *clavata* (F.). Duponchel and Chevrolat 1842 cite *Aspidomorpha* in synonymy but its originally designated genotype, *C. miliaris* F., is not congeneric with that of *Deloyala* Chev. (=*Chirida* Chap.). *Deloyala* Redtenbacher 1858 is merely a misuse of the name applied to a group not originally included.

Asteriza Chev. 1837 (pp. 372, 396) is monobasic on *Cassida flavicornis* Oliv. 1790, which is cited as its type by Hope 1840 (p. 158) and by Duponchel and Chevrolat 1842. The genonym is commonly ascribed to Boheman 1854 as in the catalogue by Spaeth 1914.

Omoteina Chev. 1837 (pp. 374, 398), monobasic, genotype *Cassida humeralis* Oliv. 1808, also cited by Duponchel and Chevrolat 1842. *Trikona* Maulik 1916 appears to be a synonym.

Hemisphaerota Chev. 1837 (p. 367, 391), genotype *Cassida erythrocera* Germ. 1824, designated by Duponchel & Chevrolat 1842 (D'Orbigny, Dict. Univ. Hist. Nat., vol. 3, p. 210). *Porphyraspis* Hope 1840 is isogenotypic with *Hemisphaerota.*

The use of this name, *Hemisphaerota,* by Spaeth 1905 (Verh. Zool. Bot. Ges. Wien, vol. 55, p. 82) and in his catalogue 1914 (Coleop. Cat. Junk, pt. 62, p. 11) being untenable, we propose the new genonym *Spaethiella,* for the 22 species there listed and designate *Imatidium sanguineum* Fab. 1801 its genotype.

(**Spaethiella** new name, *ante,* for *Hemisphaerota* Spaeth 1905, not Chev. 1837; genotype *Imatidium sanguineum* F. by present designation.)

The names of several well known North American species of beetles are affected by these examples. These changes from the names recently used to the new combinations, or to the readoption of names formerly in use and wrongly suppressed require mention.

1. Our rarely observed subaquatic free swimming donaciid *Haemonia nigricornis* Kby. changes to *Macroplea nigricornis* (Kby.) by priority of generic names, no validation of *Haemonia* "Megerle" prior to 1821 having been found.

2. Our several species of chrysomelids breeding on *Rumex* or *Polygonum,* listed as *Gastroidea,* should again be known by the prior name *Gastrophysa* Chev. as adopted by Redtenbacher, Chapuis and others.

3. The blue tortoise beetle of the palmetto, long known as *Porphyraspis cyanea* (Say) becomes *Hemisphaerota cyanea* (Say) by isogenotypic genonym priority. A much older description of this species, *Cassida flavicornis* Megerle 1803 (Catalogus Insectorum quae Viennae Austriae, die 28 Novembris 1803, auctionis lege distrahuntur, no. 394), based on a sample from Georgia probably from Abbott through Francillon, has been overlooked, but the name is preoccupied in Olivier 1790 and does not suppress *cyanea.*

4. The rough-backed tortoise beetle of ground cherry, horse nettle and white potato, recently known as *Deloyala clavata* (F.) becomes *Plagiometriona* (*Parametriona*) *clavata* (F.) Spaeth 1937, the early genotype designation restricting *Deloyala* to *Chirida.*

5. The name of the variable spotted tortoise beetle of morning glory and sweetpotato changes from *Chirida guttata* (Oliv.) to *Deloyala guttata* (Oliv.), the species being congeneric with the genotype of *Deloyala* designated in the overlooked contribution in 1842. *Deloyala guttata lucidula* (Boh.) is the pale variety or subspecies from New York to Iowa, and *D. guttata pennsylvanica* (Spaeth) is available for those melanic individuals in which the black dorsal area contains no yellow spots. *Deloyala lecontei* (Crotch 1873), of the Sonoran region, *Deloyala extensa* (Boh.), of the Rio Grande delta, and *Deloyala barberi* (Spaeth 1936), of the Florida everglades, appear to us to be distinct species. *Deloyala*

extensa (Boh.) is regarded by Spaeth 1936 (Ent. Rundsch., Jahrg. 53, p. 139) as a mere aberration of *Deloyala guttata immunita* (Boh.) of Yucatan, but our samples from Brownsville, Tex., and the original descriptions do not support this view.

Synonymic Notes on Dysdercus A. & S. (Hemip).—In 1926 Blatchley suggests that *Capsus ocreatus* Say is the same as *Dysdercus andreae* Linné. The former species was placed by Stål in *Dysdercus*. However, apparently it cannot be the same as the latter.

Say, in his description, unequivocally states: "beneath *immaculate*" (Italics mine). Now, the numerous specimens I have of *D. andreae,* determined both by Dr. R. F. Hussey and Mr. E. P. Van Duzee, all have the ventral segments distinctly white-margined posteriorly; and the sternal sclerites are also white posteriorly. This cannot have escaped Say, who, in *Capsus* (*Dysdercus*) *mimus* immediately following brings out that it is "beneath white, with the incisures sanguineous," which is a no more obvious character than the white incisures in *D. andreae.* We must conclude, therefore, that whatever Say may have had before him from Georgia, it was either an aberrant specimen of *andreae,* or else nearly certainly something quite different. At any rate, no one seems to have seen *Capsus ocreatus* since Say's day.

The only references to this species are: the original description; Stål's in Enumeratio (I: 124), where he says "Ad hanc familiam verisimiliter pertinent: 1. *Capsus ocreatus* Say" and a number of others he lists; Uhler, in his Check List, a mere mention; Van Duzee in his Catalogue omits Stål's citation; and Blatchley's (Hem. E. N. Am., p. 442), where he advances the idea that *ocreatus* Say may be *andreae* L., without discussion. The latest reference is by Hussey, in his Catalogue of the Pyrrhocoridae (General Catalogue of the Hemiptera, fascicle III, p. 97). Obviously, none of these authors had seen an authentic specimen, and they knew it only from description.

In my 1912 paper "Records of Heteroptera from Brownsville, Texas" (Ent. News, XXIII, p. 121) I recorded *Dysdercus obscuratus* Dist. In his pending work on a survey of the Pyrrhocoridae, Dr. Hussey, in 1931, determined my specimens from Brownsville as *Dysdercus incertus* Distant, described from Costa Rica. Accordingly, this correction is made. This the first record of the species north of Mexico.—J. R. de la Torre-Bueno, Tucson, Arizona.

NEW U.S.A. ROBBER FLIES (DIPTERA: ASILIDAE).

By Stanley W. Bromley, Stamford, Conn.

Several interesting collections have been submitted to me recently for identification. In these collections were disclosed ten new species of Asilidae, descriptions of which are given in this paper.

Acknowledgments are due Mr. Josef Knull, Curator of the Ohio State University collection, Dr. R. H. Beamer of the University of Kansas, Mr. E. P. Van Duzee of the California Academy of Sciences, Mr. Joseph Schuh of Oregon State College, Dr. J. C. Bradley of Cornell University and Mr. F. S. Blanton of Babylon, New York.

Promachus atrox n. sp.

Total length, 26–29 mm. A robust, very dark colored species of the *bastardi* group, evidently related to *P. truquii* Bellardi, having the mystax mostly and the beard entirely white and with a dense patch of white hairs on the anterior aspect of the front coxae. The wings are brownish with a dark shadow in the distal fourth of the marginal cell and the first submarginal cell with a gray median shadow occupying the central three-eighths of the cell. The hypopygium on the dorsum bears a dense mass of silvery white hairs.

Male. Head black, vertex brown pollinose, face silvery pollinose shading to brown towards the lower orbital region. Mystax narrow, densely white with a few fine black hairs intermingled; hairs of vertex and occipital bristles, black; occiput with fine white hairs; pronotum with black bristles; beard densely white; palpi with coarse black bristles. Thorax black, dark chocolate brown pollinose; hairs and bristles of mesonotum black; scutellum densely covered with coarse black bristles; legs piceous, the fore legs brownish. The legs bear black hairs and bristles, although there are some pale hairs on the coxae and femora, while the anterior coxae bear a dense tuft of white hairs on the anterior portion. Wings smoky brown with deep gray shadows in the marginal and submarginal cells. Halteres with pale brown knobs, pulvilli pale yellowish brown. Abdomen deep black with largely black hairs, the sides and venter with dark chocolate brown pollen. There are a few scattered white hairs on the sides of the tergites. Hypopygium short and broad wider than, but equal in length to, the last two segments. The ventral portion is black-haired while the dorsum bears a dense tuft of silvery white hairs.

Female. Similar, but with several white hairs among the black bristles of the scutellum. In both sexes the wings project beyond the tip of the abdomen.

Holotype, male, Chiricahua Mts., Sept. 14, 1938 (D. J. and J. N. Knull, collectors).

Allotype, female, same data. (Both types in Ohio State University Collection.)

This species differs from *P. bastardi* and *P. truquii* in the general black coloration with the contrasting snow-white mystax, beard, and tufts on the anterior coxae.

Erax vertebratus n. sp.

Total length 16–23 mm. A grayish white pollinose species with the abdomen banded with black, very similar to *zonatus* Hine but distinguished by the larger, broader hypopygium, the upper forceps being broader and more bulbous than in *zonatus*. The hypopygium is black or piceous instead of red as in *zonatus*. I am unable to satisfactorily distinguish the females.

Holotype, male, Warner Springs, Calif., July 28, 1938 (Jean Russell).

Allotype, female, Idyllwild, Calif., July 29, 1938 (Jean Russell). (Both in University of Kansas Collection.)

Paratypes, males, Warner Springs, Calif., July 28, 1938 (Jean Russell), Towie, Calif., (Jean Russell); females, Warner Springs, Calif., July 28, 1938 (Jean Russell), Chiricahua Mts., Ariz., July 14, 1938 (Jean Russell).

Erax subaridus n. sp.

Total length 14–22 mm. A black species, grayish pollinose, of the *aridus* group as outlined by Hine, the furcation of the third vein nearly oposite the base of the second posterior cell.

Male. Mystax white above, black below. Beard white. Bristles of vertex black (a few yellow); of occiput yellowish. Palpal bristles black, a few whitish. Thorax gray pollinose with the usual mesonotal markings partly obscured. Mesonotum and scutellum with abundance of black hairs and bristles, a few bristles above the base of the wing yellowish. Legs black with bases of tibiae reddish, thickly white-haired with some yellowish white and some black bristles. Abdomen black, white-haired; the posterior and lateral margins of tergites pale pollinose; tergites six and seven silvery gray. Genitalia with pale hairs.

Female. Similar. The ovipositor about equal in length to the three preceding segments combined. The scutellum bears in addition to the black, several pale hairs and bristles.

Holotype, male, Tuscon, Ariz., Mar. 8, 1937 (W. Benedict).

Allotopotype, female, same data. (Both in University of Kansas Collection.)

Paratopotypes, 13 males, 21 females, same data.

Paratypes, male, Baboquivari Mts., Ariz., Mar. 31, 1937 (W. Benedict); 2 males, 2 females, base of Pinal Mts., Ariz., Mar. (D. K. Duncan). The latter were kindly sent to me by Mr. Duncan of Globe, Ariz., and are in my collection.

This species is closely related to *aridus* Will. but is smaller, darker and the hairs and bristles of the scutellum are mostly black instead of pale, while there are more black bristles on the legs. The series of paratypes from the base of the Pinal Mts., Ariz., collected by Mr. Duncan, are larger (21–25 mm.) and blacker with even more black bristles on the legs.

Erax benedicti n. sp.

Total length 15–20 mm. A pale yellowish-brown pollinose species of the *stramineus* group, quite distinct from *dubius* Will., *stramineus* Will. and *rapax* O. S. in that the eighth sternite in the male is greatly prolonged and bowed under the base of the hypopygium.

Male. Most of the vestiture of the head is whitish. Bristles of vertex and occiput mostly black, a few yellow. Mesonotum pale yellowish brown pollinose; pleura gray-pollinose. Mesonotal hairs and bristles black, some fine white long pile posteriorly. Scutellum with fine white hairs and yellowish-white marginal bristles. Wings hyaline, the furcation of the third vein slightly before the middle of the distance between the base of the second posterior cell and the small cross vein. Legs black (bases of tibiae reddish) with white hairs and black bristles in most cases but some have most or all of the bristles pale. Abdomen silvery-gray pollinose with white hairs, those on tergites 1–4 long and parted in the middle, those on 5 shorter, but still parted; 6 and 7 have only very short hairs. The eighth sternite is produced to about the length of the sixth tergite. Genitalia blackish with both black and pale short hairs, longer than segments 6 and 7 combined, narrow, somewhat truncate at the tip from the side view. (Fig. 1.)

Female. Similar. Occipital, vertical and mesonotal bristles all or mostly pale. There are a number of pale bristles on the legs also. Ovipositor slender, black, slightly longer than segments 5, 6, and 7 combined.

Holotype, male, Winslow, Ariz., June 13, 1937 (W. Benedict).

Allotype, female, Santa Rita Mts., Ariz., May 9, 1937 (W. Benedict). (Both these types in University of Kansas Collection.)

Paratypes, 3 males, 14 females, Santa Rita Mts., Ariz., May 9, 1937 (W. Benedict); 1 female, Winslow, Ariz., June 12, 1937 (W. Benedict); 2 males, 2 females, Baboquivari Mts., Ariz., Apr. 19, 1937 (W. Benedict); 2 females, Grand Canyon, Ariz., June 12, 1937 (W. Benedict); 2 females, Doney, Ariz., June 13, 1937 (W. Benedict); 1 female, Mustang Mts., Ariz., May 18, 1937 (W. Benedict); 1 male, Tuscon, Ariz., Apr. 24, 1937 (W. Benedict); 1 male, Douglas, Ariz., May 18, 1937 (W. Benedict).

There is considerable variation in the proportion of black and yellow bristles on the vertex, occiput and legs. Some males, like most of the females, have these bristles all pale, while in a few instances there may be a stray black bristle or two on the scutellum. In some females there may be black bristles on the occiput.

I have named this species in honor of W. Benedict who has collected a great many Asilidae as well as other insects for the University of Kansas in the Southwest and who had obtained the entire series of this apparently overlooked species.

Erax wilcoxi n. sp.

Total length 10.5 mm. Described from a single male. A very small, unique species of the *stramineus* group, running in my Texas Key to *pilosus* Hine but differing in having the bristles of the posterior portion of the mesonotum black, the abdomen black banded and only sparsely haired, and in the shape of the genitalia. The furcation of the third vein is distinctly beyond the middle of the distance between the base of the second posterior cell and the small cross vein. The femora are black, the mystax and scutellum white-haired.

Male. Head white pollinose, vestiture white, except distal portion of palpi where the hairs are black. Thorax gray-white pollinose, with more of a brownish tone above. Coxae and pleura with white hairs. Mesonotum with black hairs and bristles, except supra-alars which are pale yellow. Scutellum with pale hairs and bristles. Legs reddish with femora black. Wings hyaline, iridescent. Abdomen gray-white pollinose:

tergites two, three, four, five and six with a black band; hairs more sparse than in most members of *stramineus* group. Genitalia reddish-yellow with pale hairs. (Fig. 2.)

Holotype, male, Uvalde, Texas, June 15, 1930 (J. O. Martin). (Calif. Acad. Sci.)

I have named this unique species in honor of Mr. Joseph Wilcox of Alhambra, Calif., who has contributed so much to our knowledge of the Asilidae of the Western States.

Asilus knulli n. sp.

Total length 10–12.5 mm. A small black species differing from *A. citus* Hine in that the legs and genitalia are all black.

Male. Black, gray pollinose; the genitalia small, narrow-pointed, black. Face gray-white pollinose. Mystax whitish with a few black bristles above. Beard white. Vertex and occiput with black bristles. Legs black with fine pale hairs. Bristles of mesonotum black. Scutellars (2) black. Wings subhyaline, apex and posterior margin faintly gray.

Female. Similar. Three scutellars in allotype, one black, two straw-colored.

Holotype, male, Huachuca Mts., Ariz., July 20, 1936 (J. N. Knull).

Allotype, female, same data. (Both types in Ohio State University Coll.)

Paratopotype, male, same data.

Paratype, female, Chiricahua Mts., Ariz., July 26, 1937 (J. N. Knull); male, Chiricahua Mts., Ariz., July 14, 1938 (R. H. Beamer).

This species is named in honor of Mr. Josef N. Knull, Curator of the Ohio State University Insect Collection.

Asilus schuhi n. sp.

Total length 14–17 mm. A black species almost completely grayish-white pollinose with completely black legs and four or more upright black bristles on the margin of the scutellum.

Male. Pollen of the head whitish with a yellowish tinge. Mystax largely white but with a few black bristles in the upper portion. Beard white. Palpi with a few dark bristles. Bristles of vertex, antennae and occiput black. Antennae black, the third segment flattened, appearing linear from above, oval from the side. Arista curved outward, slightly shorter than the third segment. Thorax pale brownish-gray pollinose, giving an ashy appearance when viewed from a distance.

Mesonotum with black hairs and bristles. Scutellum ashy-gray pollinose, with about six upturned black marginal bristles, disc of scutellum with pale hairs. Pleura with pale hairs, the hypopleura with a tuft of long whitish hairs. Coxae with white bristles. Legs black, densely covered with fine white hairs but the bristles black. Wings pale smoky brown, abdomen gray pollinose, the median portions of the tergites with a distinct brownish tinge, hairs white. Hypopygium small, compact, piceous, with some black and some white hairs.

Female. Similar, but with only four marginal scutellars. Ovipositor short, conical, black, slightly less in length than segments six and seven combined.

Holotype, male, Parkdale, Ore., June 30, 1938 (E. Gray and J. Schuh).

Allotopotype, female, same data. (Both types in Oregon State College Coll.)

Paratopotypes, 3 males, 1 female, same data.

I am naming this species in honor of Mr. Joe Schuh, an active collector of Asilidae in Oregon. *Asilus schuhi* appears to be related to *A. callidus* Will. from which it may be readily distinguished by the completely black legs and the ashy-gray pollinose condition of the entire body.

Asilus floridensis n. sp.

Total length 14–15 mm. A small dark brown species with the posterior aspect of the femora more or less reddish. The tibiae reddish with black tips and a black spot on the middle of the inner side. Runs to *johnsoni* Hine in Hine's Key in Ann. Ent. Soc. Amer., II, fig. 2, p. 144, 1909, but differs in being smaller and having the male genitalia black instead of dark red. Differs from *prairiensis* Tucker in having the occipital bristles black and the arista nearly as long as the third antennal segment.

Male. Mystax straw-yellow, upper portion with black bristles. Beard pale straw-colored. Bristles of antennae, vertex, and occiput black. Arista nearly as long as third antennal segment. Thorax brownish pollinose with a black median line extending from pronotum to scutellum dividing into three thin lines posteriorly. Legs reddish, femora blackish, except distal fifth to third and the posterior aspects which are reddish. Tibiae reddish with tips black and a broad black spot at the middle of the inner aspect. Tarsal segments reddish with black tips. Hairs of coxae and pleura yellowish, bristles of leg black. Hairs and bristles of mesonotum black, scutellars (2) black. Posterior tibiae with three bristles on the anterior aspect. Wings pale reddish, subhyaline. Abdomen grayish brown pollinose, posterior and lateral margins of segments grayish pollinose. Genitalia black. (Fig. 3.)

Holotype, male, Ocala, Fla., Nov. 5, 1932 (F. S. Blanton). (In S. W. Bromley Coll.)

Paratopotype, male, same data.

Asilus fattigi n. sp.

Total length 23–26 mm. A large light brown species with red legs, related to *antimachus* Walker but differs in having the femora entirely reddish.

Male. Mystax whitish with one or two black bristles above. Beard and genal hairs white. Occipital bristles black. Arista three-fourths the length of third antennal segment. Palpi very small, thinly haired with small dark pile. Mesonotum pale yellowish pollinose with a broad black median stripe and three dark lateral spots on each side. Scutellum yellowish pollinose with fine black hairs on disc and two long black bristles on margin. Wings long and broad, hyaline, the tip and posterior borders suffused with gray. Abdomen yellowish gray pollinose, the tergites with darker dorsal areas. Bristles at sides of abdominal segments straw-colored. Legs red; knees, extreme tips of tibiae and of tarsal segments blackish. Bristles of legs black. Halteres yellowish. Genitalia black. (Fig. 4.)

Female. Similar. Ovipositor conical, laterally compressed, slightly longer than segments six and seven together.

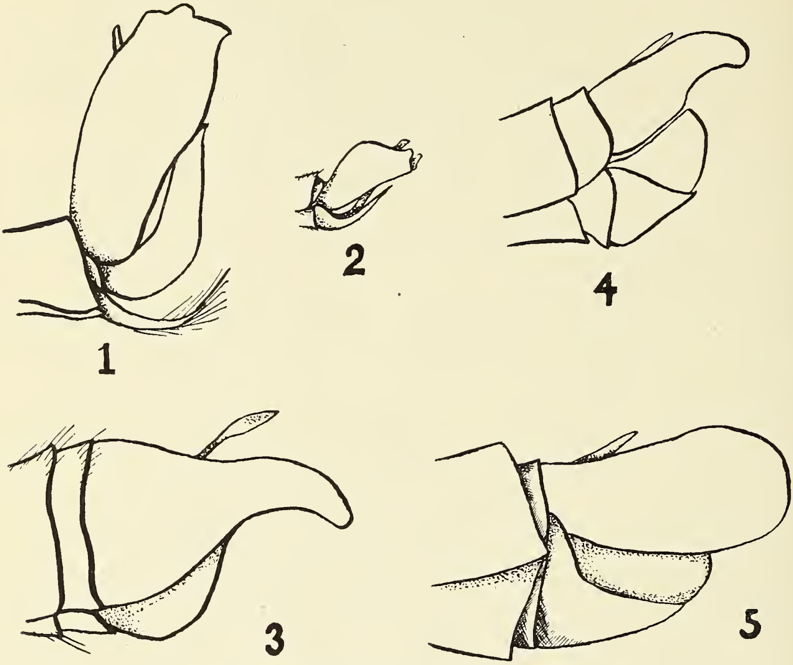
Holotype and *Allotopotype,* male and female, both on same pin. Spring Creek, Ga., May 18–21, 1916. (J. C. Bradley.) (In Cornell University Coll.)

Paratype, male, Savannah, Ga., May 24, 1931.

I take pleasure in naming this species in honor of Prof. P. W. Fattig of Emory University, Ga., who has worked extensively on faunal lists of Georgia.

Asilus blantoni n. sp.

Total length 16–21 mm. A grayish species with two to four black marginal scutellars, arista of antenna about three-fourths the length of the third segment, and two bristles on anterior aspect of hind tibiae. Related to *notatus* Wied. but differs in having the tips of the femora largely red, the tibiae and tarsi mostly reddish,



EXPLANATION OF FIGURES.

(Lateral aspect of Male genitalia.)

FIG. 1. *Erax benedicti* new species.
FIG. 2. *Erax wilcoxi* new species.
FIG. 3. *Asilus floridensis* new species.
FIG. 4. *Asilus fattigi* new species.
FIG. 5. *Asilus blantoni* new species.

and in bearing long fine white pile on the under sides of the two anterior pairs of femora.

Male. Mystax with thick interior hair, pale straw yellow: outside bristles blackish. Beard white, palpal hairs and bristles of vertex and occiput black. Thorax grayish pollinose. Mesonotum with median black stripe tapering posteriorly and fading before the scutellum is reached; the lateral spots are large and confluent. Hairs and bristles of mesonotum black. Scutellum gray pollinose with usually four long black marginal bristles. Hairs and bristles of pleura and coxae whitish. Wings grayish, subhyaline, interior of cells grayish. Halteres pale yellowish red. Bristles of legs black. Femora black with tips broadly reddish and with long thin pile on the under sides. Tibiae reddish, extreme tips black; tarsi reddish with tips black. Abdomen brownish black, posterior margins somewhat grayish pollinose. Genitalia (Fig. 5) blackish, more compact than in *notatus*.

Female. Similar. Ovipositor conical, laterally compressed, about equal in length to segments six plus seven.

Holotype, male, Bratt, Fla., April 1, 1933 (Alton Blanton).

Allotopotype, female, April 11, 1933. (In S. W. Bromley Collection.)

Paratopotypes, 4 males, 4 females, Apr. 1–11, 1933 (Alton Blanton).

This species is named in honor of the Blanton brothers, F. S. and Alton, both having collected extensively in Florida, the former an authority on the Trypaneidae.

Another Mantispa Reared.—In a pasture at Bethany, Conn., on August 15, 1939, I collected from under stones several females of *Gnaphosa muscorum* (L. Koch) guarding their egg sacs. On the chance that parasites were within, these sacs as well as those from other spiders were set aside for further observation. On September 1 a callow specimen of *Mantispa interrupta* Say was found to have emerged from a pupal skin on the outside of one of the egg sacs. This skin, and the manner of emergence of the imago were similar to those already described by me for *M. fusicornis* Banks, (1938 J. New York Ent. Soc., XLVI: 147–153). Like the pupal cocoon of *fusicornis,* this one was greenish, loosely woven, and had spider egg shells adhering to it.

Hungerford's observation (1939 Bull. Brooklyn Ent. Soc., XXXIV: 265) makes it practically certain that my specimen of *fusicornis* originated in Michigan, not Connecticut. Therefore, my rearing of *interrupta* constitutes the first Connecticut record for a species of *Mantispa.*—B. J. Kaston, Brenau College, Gainesville, Ga.

NEW SPECIES OF BEES OF THE GENUS DIADASIA FROM CALIFORNIA (HYMENOPTERA, APOIDEA).

By P. H. Timberlake, Riverside, California.

Diadasia lutzi Ckll.

Through the courtesy of Doctor Cockerell I have had the privilege of examining paratypes of this species from Green River, Wyoming (Lutz). Unexpectedly, *lutzi* proves to be very similar to two forms of *Diadasia* found on the deserts of California, and because of the close agreement in most characters it seems advisable to regard the latter as races of *lutzi*. The males of the three forms are extremely similar, but I find small differences in the genitalia, which, however, appear not to be entirely constant between the two California races. The females are more easily separated, but the differences are chiefly in color of the pubescence, although the clypeus in the California races is much more closely punctured than in *lutzi*.

Diadasia lutzi difficilis n. subsp.

Male.—Like *lutzi*, but teeth at apex of tergite 7 finer and not divergent. Genitalia similar except as follows: Inferior apical appendage of stipites less acuminate at apex and curvature of its outer margin forming a much shorter arc restricted to basal third. Superior apical appendage much smaller than in *lutzi*, about one-fifth to one-fourth as long as inferior appendage. Hair of abdomen erect, moderately long and dense, that at apex of tergites 2 to 6 depressed and forming a narrow white band. Hair on basal half, or more, of tergites 3 to 6 and all on 7, except marginal fringe, black. Some of the long erect hair just preceding apical band on 3 to 6 light, whereas in *lutzi* the white hair is more definitely restricted to the depressed apical band. Hair of venter mainly light, but fuscous on blackish on ventrites 4 and 5 except apical fringe. (Hair of venter in *lutzi* nearly all dark.) Pile of ventrite 6 blackish, rather dense across apical margin and forming a dense longer tuft on each side at base, just as in *lutzi*. Pubescence on upper parts of head and thorax varying from pale fulvo-ochraceous to nearly cinereous. Apex of hind tibiae beneath with a weak blunt lobe over base of spurs. Length, 7–8.5 mm.; anterior wing, 5.6–6.2 mm.

Female.—General appearance almost exactly as in *lutzi* but differing as follows: Punctures of clypeus much closer, more or less sulcate, the surface comparatively rugose. Apical margin of tergites very narrowly whitish hyaline beneath the bands. Pubescence whitish, usually becoming pale brownish ochraceous on mesonotum. Hair at base of tergites 2 to 4 and to a less extent at base of 5, black, but that on 2 sometimes nearly all light. (Abdomen in *lutzi* has no dark hair except at apex and beneath.) Apical bands as seen from above under a lens broadening in middle, not sharply defined, but appearing to naked eye narrow, white and marginal. Hair of venter mainly black, but apical fringe of ventrites 3 and 4 more or less white on each side. Scopa of hind legs brownish fuscous, sometimes a little paler beneath. Length, 8–9 mm.; anterior wing, 6–6.2 mm.

Holotype male and allotype, mouth of Andreas Canyon, near Palm Springs, California, at flowers of *Sphaeralcea ambigua,* March 24, 1933 (Timberlake). The following are paratypes: 11 males, 4 females, at same flower and place, March 24 to April 24; 3 males, near mouth of Murray Canyon, at same flower, March 21; 1 male, Palm Canyon, on *Sphaeralcea rosacea,* March 25; 1 male, near Westmoreland, on *Sphaeralcea orcutti,* May 31; 1 female, Cave Springs, San Bernardino County, on *Sphaeralcea ambigua,* April 30; 3 males, Tolleson, Arizona, on *Sphaeralcea,* May 29 (all Timberlake); and 1 male, San Quentin, Lower California, April 10 (B. J. Hall). The following paratypes were collected by C. D. Michener and belong in his collection: 1 male, Andreas Canyon, April 10; 1 female, 15 miles south of Twenty-nine Palms, April 14; and 2 males, 2 females, Westgard Pass, Inyo County, males collected May 27, the females June 15 at summit. All the Michener specimens at flowers of *Sphaeralcea ambigua.*

Diadasia lutzi deserticola n. subsp.

Male.—Not distinguishable from *difficilis* except by the genitalia. Inferior apical appendages of stipites narrow, slightly dilated at base and slightly tapering to apex. Superior apical appendage smaller than in *difficilis,* hardly more than one-sixth as long as inferior appendage. Length, 7–8.5 mm.; anterior wing, 5.5–6 mm.

Female.—Differs from *difficilis* in having the light hair of abdomen ochraceous instead of white, and very little black hair at base of tergites 2 to 4. The black usually restricted to the coarser, erect, interspersed hairs, although in one specimen there is a small amount of depressed black hair at extreme base of tergites 3 and 4. From *lutzi* it differs in the much closer, more sulcate puncturation of clypeus and the ochraceous hair of tergites, interspersed on the base of the segments with erect dark hairs. The apical bands are dense but grade insensibly into the thinner hair covering disk of tergites. Scopa of hind legs with much more light hair on underside than in either *lutzi* or *difficilis*. Length, 7–8 mm.; anterior wing, 5.8–6 mm.

Described from 5 males, 3 females (holotype male, allotype and paratypes), Salt Creek, Chocolate Mountains, Imperial County, California, at flowers of *Sphaeralcea ambigua,* March 19 and 20, 1927 (Timberlake).

One of the paratype males has genitalia practically as in *difficilis,* and another has them somewhat intermediate. This subspecies is evidently a local race that may prove to be restricted to the Chocolate Mountains on the east side of the Salton Sink.

Diadasia vallicola n. sp.

Most similar to *D. afflicta* (Cress.), but hair of abdomen longer, the pale hair-bands appearing wider when viewed from the side, as some of the long as well as the shorter depressed apical hair is whitish, and differing also decidedly in the male genitalia.

Male.—Black, the tarsi rufescent, spurs testaceous. Flagellum brown beneath except at base. Tegulae ferruginous, darker at base. Wings nearly clear hyaline. Nervures brownish fuscous, the middle of stigma ferruginous. Head broader than long, the inner orbits divergent above. Third antennal joint nearly equally 4 + 5, the middle joints of flagellum as long as wide. Head and thorax shining, finely and closely punctured. Punctures on cheeks and on each side of vertex very fine and weak. A large impunctate area on each side of vertex, just exterior to the lateral ocelli. Posterior middle of mesocutum more or less sparsely punctured. Basal area of propodeum polished. Middle and hind femora and tibiae moderately incrassate, the hind tibiae less swollen than in *afflicta,* with a shorter, less distinct basal neck. Under side of hind tibiae not lobate at apex over base of spurs. Spurs weakly hooked at apex. Two apical teeth of tergite 7 small, hardly differing from *afflicta.* Pubescence brownish to pale ochraceous, paler or whitish beneath, moderately long and dense on head and thorax, but area between upper ends of eyes nearly nude. Hair on outer side of tibiae rather dense, denser than in *afflicta.* Hair of abdomen rather long and erect, becoming shorter and depressed at apex of tergites 2 to 5, and shorter across the base of 2 to 6. Hair of tergites 1 and 2 entirely light, not appreciably longer on the base of 1, as it is in *afflicta* and other species. Hair on basal half, more or less, of tergites 3 to 6 black, the remaining hair ochraceous or whitish, the apical band consequently not sharply defined because of the light long erect hair preceding it. Hair of tergite 7 more or less black on disk and ochraceous at margins. Hair of venter light, especially the apical fringes, but with much brown or fuscous hair on disk of ventrites 4 and 5. Ventrite 6 covered with short erect brown pile, which becomes about twice as long but hardly denser to form an inconspicuous tuft on each side at base. (In *afflicta* the pile of ventrite 6 is uniformly short.) Length, about 9 mm.; anterior wing, 6.9–7.1 mm.

Holotype male at flowers of *Sphaeralcea orcutti*, near Westmoreland, Imperial County, California, May 31, 1930 (Timberlake). Also 3 male paratypes from Arizona, all on *Sphaeralcea:* One at Tolleson, May 28, 1933 (Timberlake), one at Wickenburg, March 30, 1934 (Timberlake), and one on the Silverbell road, 12 miles west of Rillito, May 2–5, 1935 (A. J. Basinger).

The Arizona specimens have darker tarsi and tegulae than the type.

Diadasia martialis n. sp.

Allied to *D. nitidifrons* Ckll., but basal area of propodeum polished, the base of tergites with much more black hair, the light apical bands better developed and mesoscutum almost uniformly and rather closely punctured, instead of subimpunctate on the posterior middle. The females are more similar than the males, but distinguishable by the sculpture of the basal area and mesoscutum. From *D. consociata* Timb. it differs in larger size and longer, more erect pubescence.

Male.—Black, the tarsi refuscent. Spurs ferruginous. Flagellum sometimes reddened beneath. Tegulae either almost black, or more or less rufescent especially on outer margin. Wings dusky hyaline, the nervures black. Head distinctly broader than long, the inner orbits diverging above. Third antennal joint slightly shorter than 4 + 5, the middle joints of flagellum as long as wide. Middle and hind femora and tibiae moderately incrassate. Hind tibiae produced at apex beneath in a short blunt lobe over insertion of spurs. Hind basitarsi curved as usual, the apex slightly dilated and truncate. Apical teeth of tergite 7 varying from short and blunt to rather long and slender. Apical margin of ventrite 5 emarginate at middle. Head and thorax shining, finely, rather closely punctured, most closely on the face and clypeus. Sides of vertex more minutely punctured, with a large impunctate space just exterior to lateral ocelli. Punctures of mesoscutum almost uniformly spaced, those on anterior part of scutellum a little sparser. Basal area of propodeum polished. Pubescence rather long and dense, ochraceous, becoming almost white on face, under parts and front femora. Area between upper ends of eyes nearly nude as usual. Hair of mesonotum erect, uniform in length and density. Hair of abdomen erect, but not quite as long and shaggy as in *nitidifrons.* Depressed hair at apex of tergites 2 to 5 forming a narrow even pale ochraceous or whitish band. Band at apex of 6 broader, more ochraceous. Basal half, or a little more, of tergites 3 to 6 covered with black hair, and the hair of the remainder of disk long and ochraceous. Hair of tergite 7 dark ferruginous, appearing black in some aspects, becoming more or less paler at apex. Hair of venter sometimes entirely ochraceous except on last segment, or with more or less brownish or fuscous hair on ventrites 3 to 5. Ventrite 6 with dense, moderately long, erect, fuscous pile on apical half. Hair on outer side of tibiae and basitarsi rather dense and ochraceous. Length, 8–10 mm.; anterior wing, 7.1–7.8 mm.

Female.—Much like the male. Mandibles sometimes with a large testaceous yellow spot near apex. Clypeus moderately coarsely and closely punctured. Pubescence similar, but becoming short, rather thin and appressed on middle of mesoscutum. Hair of abdomen mainly appressed, except at base of first tergite. More than basal half of tergites 2 to 4 and base of 5 with black hair. Apical bands on 1 to 4 ochraceous or white, rather broad, widening on middle of 3 and 4. Tergite 5 with a broad light band. Hair on apical margin of 5 and on sides of 6 dark ferruginous or black. Hair of venter black except at sides. Scopa of hind legs ochraceous, sometimes a little infuscated above and on basitarsi. Hair on inner side of hind basitarsi dark ferruginous or black. Hair on under side of front femora long, moderately dense, nearly white, that on inner side of front basitarsi ferruginous. Length, 8–9 mm.; anterior wing, 6.2–7.2 mm.

Described from 5 males, 3 females (holotype male, allotype and paratypes) collected at Salt Creek, Chocolate Mountains, Imperial County, California, at flowers of *Sphaeralcea ambigua,* March 19–20, 1927 (Timberlake). Also the following paratypes: 6 males, 2 females, Palm Canyon, Riverside County, on *Sphaeralcea rosacea,* March 25; 1 female, near Murray Canyon, on *Sphaeralcea ambigua,* March 21; 8 males, near mouth of Andreas Canyon, on same flower, April 19 and 22; 1 male, La Quinta, on *Sphaeralcea rosacea,* April 24; 2 females, 28 miles south of Twenty-nine Palms, on *Sphaeralcea ambigua,* April 14, (all Timberlake); 2 males, Tahquitz Canyon, near Palm Springs, on *Larrea divaricata,* March 24 (C. M. Dammers); and 1 female, mouth of Andreas Canyon, on *Sphaeralcea ambigua,* April 10 (C. D. Michener) in Michener collection.

Diadasia palmarum n. sp.

Allied to *D. lutzi* Ckll., but larger, hair of abdomen more depressed, that of seventh tergite usually light, and sixth ventrite with short dense pile at apex, nude across the middle and with a large dense brush of hair on each side of base nearly meeting in the middle. The female differs from *lutzi* in having finer closer punctures on the clypeus, scopa much paler, and hair at apex of abdomen ferruginous or chocolate brown.

Male.—Black, the tarsi and under side of flagellum rufescent. Small joints of tarsi, more or less, and spurs ferruginous. Tegulae piceous, or more or less refuscent on outer margin. Wings dusky hyaline, nervures piceous. Head broader than long, inner orbits divergent above. Third antennal joint nearly equalling 4 + 5, the middle joints of flagellum as long as wide. Middle and hind femora and tibiae moderately incrassate. Hind tibiae not lobate beneath at apex. Hind basitarsi curved as usual, very obliquely truncate at apex. Head and thorax finely and closely punctured, the punctures weaker as usual on vertex. A small impunctate area just exterior to each posterior ocellus. Punctures of pleura and posterior part of mesoscutum sparser, with an impunctate space on each side of the posterior middle of the latter. Basal area of propodeum polished. Apical teeth of seventh tergite short and blunt, separated by a space equal to, or much less than, their own width. Pubescence ochraceous, paler beneath, rather long and dense on head and thorax. Space between upper ends of eyes nearly nude. Pubescence of abdomen ochraceous, black on basal half of tergites 3 to 6, the appressed apical band on 2 to 6 narrow and more or less whitish. Hair of tergites 1 and 2 erect, that on following segments somewhat depressed, especially on basal half. Hair of tergite 7 usually light, sometimes black at base. Hair of venter light, but tinged with brown on ventrite 6, that on 5 and base of 6 very dense. Hair of legs ochraceous, more whitish on front pair, that on outer side of tibiae and basitarsi rather dense. Length, 9–10 mm.; anterior wing, 6.8–7.5 mm.

Female.—Similar to male. Mandibles sometimes with a testaceous yellow mark subapically. Punctures of clypeus a little coarser than those of frons and rather denser. Posterior middle of mesoscutum nude and impunctate. Pubescence pale ochraceous, or cinereous, mainly depressed on abdomen except at base of first tergite. Hair on basal half of tergites 3 to 5 black. Apical band on 1 to 4 broad, whitish, slightly emarginate on each side anteriorly on 3 and 4. Apical band on tergite 5 and hair on sides of 6 ferruginous or chocolate brown. Hair of venter brown, the apical fringe of ventrite 4 and that of 3 on each side, white. Scopa of hind legs ochraceous, slightly tinged with brown, especially on basitarsi. Hair on inner side of basitarsi dark ferruginous or blackish. Long hair on under side of front femora moderately dense and whitish. Length, 8–10 mm.; anterior wing, 6.6–7 mm.

Described from 10 males, 9 females (holotype male, allotype and paratypes) taken near mouth of Andreas Canyon, Riverside County, California, all at flowers of *Sphaeralcea ambigua,* except one female on *Eriogonum fasciculatum,* var. *polifolium,* March 24 to April 24; and 1 male (paratype) on *Sphaeralcea rosacea,* La Quinta, April 24 (Timberlake).

Diadasia australis californica n. subsp.

This subspecies of *D. australis* (Cress.) has formerly been confused with *D. opuntiae* Ckll. and some records and many determinations of *opuntiae* belong with *californica. D. opuntiae* was described from the female from San Pedro, California, and the male has been described recently and associated with the female by Doctor Cockerell. It appears to be confined to a narrow coastal strip from San Diego northward to Santa Barbara and also occurs on some of the islands. *D. australis californica* occupies a more interior area and extends to both deserts.

Female.—Differs from typical *australis* from Colorado in having more or less black or fuscous hair at base of tergites 2 to 4, the pale hair being confined to a broad apical band more or less widened in the middle. The pubescence in general and especially that of the mesonotum usually has a brighter and more fulvous tinge than in *australis.* The dorsal half of scopa of hind legs tinged with pale brown. The pubescence and banding of abdomen that easily separates it from *australis* causes difficulty, however, in its separation from either *D. opuntiae* Ckll., or *D. rinconis* Ckll. From *opuntiae* it differs in having a smaller, more funnel-shaped and duller enclosure on the propodeum. The pubescence and puncturation of the mesoscutum also a little less dense. From *rinconis* it probably can not in all cases be distinguished with certainty, but the average size is distinctly larger and the pubescence more tinged with fulvous. (The pubescence in *rinconis* strongly verges to cinereous.) Third antennal joint somewhat more than twice as long as its apical thickness and a little longer than joints 4 and 5 combined. (In *rinconis* joint 3 about twice as long as its apical thickness and equal or subequal to 4 + 5.) The lateral part of vertex between the ocelli and nearest eye margin minutely tessellate and very finely punctured. (In *rinconis* this area is polished and there is a large impunctate space on each side extending obliquely outward from the lateral ocellus to the summit of the eye.) Pubescence of scutellum and posterior part of mesoscutum a little longer and less depressed than in *rinconis.* In *rinconis* the pale hair band on tergite 2 extends broadly forward to the base on each lateral margin. In *californica* these lateral extensions of the band are less marked. The hind knee plate of *californica* on the average is narrower and has a straighter posterior margin than in *rinconis.* Length, 12–14 mm.; anterior wing, 8.8–10 mm.

Male.—Agrees structurally with *D. australis* (Cress.) and is hardly distinguishable except that it averages larger in size and usually has a brighter and more fulvo-ochraceous pubescence. It differs from *D. opuntiae* in the duller enclosure of propodeum and the comma-shaped process on hind basitarsi. (In *opuntiae* this process is evenly expanded and rounded at apex and reaches about the middle of following joint.) From *D. rinconis* it differs in its average larger size and usually brighter pubescence and is distinguished with certainty by the genitalia. In *californica* the inferior apical process of stipites is comparatively slender, somewhat ovally expanded toward the apex and depressed throughout. In *rinconis* the process is broadly dilated on apical half, distinctly thickened dorso-ventrally on basal part and abruptly depressed just beyond the beginning of the expansion into a thin laminate plate. Length, 10–15 mm. (only exceptionally under 12 mm.); anterior wing 8.2–11.5 mm.

The following specimens are paratypes except the holotype female and allotype as specified below: 36 females, 33 males (including holotype and allotype), Riverside, California, April 11 to

June 9, all at flowers of *Opuntia,* except three at nests in ground, and one male each on *Rhaphanus sativus, Convolvulus occidentalis* and *Mesembryanthemum chilense;* 1 male, 1 female, Whittier and Puente Hills, May 8 and June 24, on *Opuntia littoralis;* 3 males, 2 females, Claremont (Baker) and 1 male, 1 female, June 23 (D. W. Clancy) ; 1 male, two miles west of Perris, April 13, on *Astragalus pomonensis;* 3 males, 1 female, the Gavilan, on *Opuntia,* May 26 (C. M. Dammers), 1 male, June 10 (Dammers), 1 male, June 2, on *Helianthus gracilentus,* and 5 females on *Salvia carduacea* (not collecting pollen), May 31; 1 male, 1 female, four miles south of Fallbrook, June 24, on *Opuntia occidentalis;* 1 male, 1 female, San Bernardino, on *Opuntia,* May 12 (Dammers) ; 3 males, Forest Home, San Bernardino Mts., on *Cirsium californicum,* June 6; 1 male, Lytle Creek, on *Opuntia,* June 6; 1 male, near Banning, on *Opuntia basilaris,* April 23; 2 males, Whitewater Canyon, on *Opuntia basilaris* and *Cereus engelmannii,* April 25; 1 male, Andreas Canyon, on *Sphaeralcea ambigua,* March 24, 1 female on *Opuntia echinocarpa,* April 24; 2 males, Palm Canyon (Riverside County), March 9 (H. S. Smith) ; 1 male, six miles south of Morongo, on *Echinocactus acanthodes,* April 22; 1 male, Mohave Desert, south of the Arawatz Mts., on *Aster abatus,* April 30; 2 females, Barstow, on *Opuntia,* May 10 (Cockerell) ; and 1 male, 1 female, Alberhill, on *Opuntia,* May 30 (Dammers). Also the following in collection of C. D. Michener: 4 males, 4 females, Riverside, on *Opuntia,* April 12 to May 7; 1 male, 1 female, Altadena, on *Opuntia,* June 1 (Michener) ; 1 male, Eagle Rock Hills, on *Cirsium,* June 22 (Michener) ; 1 male, seven miles south of Whitewater, on *Echinocactus acanthodes,* April 13 (Michener) ; 2 females, Mazourka Canyon, Inyo Mts., on *Opuntia basilaris,* May 25 (Michener) ; and 1 male, fifteen miles northwest of Lone Pine, Inyo County, on *Opuntia,* May 21 (Michener). Of the specimens recorded above all not otherwise specified were collected by the writer.

Another female from Inyo County is not made a paratype as it shows the characters of typical *australis.* This was collected at the summit of Westgard Pass, on *Opuntia,* June 15 (Michener). It is also interesting to note that a female of *australis* collected by Michener at Boulder, Colorado, July 6, shows the apical bands and dark basal hair on the tergites, that are characteristic of *californica.*

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BOOK NOTES

Destructive and Useful Insects, Their Habits and Control, by C. L. Metcalf and W. P. Flint; pp. i–xiii—1–981, figs. 1–584. Second Edition. 1939. (McGraw-Hill Book Co., Inc., New York, N. Y. $7.50.)

The authors in the Preface to this second edition make two statements, which better characterize this great work than any words of ours. "Such sweeping changes have taken place in entomological practices in the more than a decade since the first edition of Destructive and Useful Insects appeared, that a complete revision, essentially a rewriting of the book, has been demanded." "Of the 918 pages of the original edition, only a few remain unchanged in the present edition. Much new material has been added, and this edition contains about twenty per cent more material than the first edition." One innovation which merits special comment is the keys to the immature stages of insects.

This work is essentially an economic entomology on a big scale. In it are to be found the latest knowledge about injurious insects and the tested methods for their control. The first two chapters discuss the relation of insects to man, and the following five their characteristics, morphology, classification and biology. The following fifteen chapters are on the control of insects and its methods; and the injuries done by insects classified according to crop anl product. The index runs to 71 pages, a very useful feature.

As I see it, while it is work of primary interest to economic entomologists, it is so full of general information not otherwise readily accessible, that general entomologists, even high specialists in stated orders, will find it an extremely useful book for reference. It is a complement to Folsom and Wardle's classic on Insect Ecology. J. R. T.-B.

A Glossary of Biological Terms, by Cyril E. Abbott; pp. 1–54, 3 plates not numbered. (Privately printed by the author, Searcy, Ark. 25 cents.)

It seems as though this writer were destined to review word-books. This paper-bound 12mo is intended for students in elementary courses in biology. The author specifically disclaims any aim to completeness, in view of its users, thus entirely disarming the reviewer. It may be said, however, that to the earnest student it may be but an appetizer for more extensive—and expensive—works. But we do not wish the author the laborious task of writing a *complete* biological dictionary. J. R. T.-B.

German-English Science Dictionary for Students in Agricultural, Biological and Physical Sciences, by Louis De Vries. Pp. i–x, 1–473. (McGraw-Hill Book Co., New York. $3.00.)

Here we have one of the most useful works for biologists recently published. While it is true that all American workers in the biological sciences should know the German and other foreign languages, it is also true that few have a complete mastery of any. Most of us can wade our way through a German text in our field, until we meet with some term unknown to us. Then we have recourse to a standard dictionary, only to find either that the term we want is not there; or if it is, it is in a literary acceptation, or else it does not cover the specialized meaning we are looking for. At this point, Dr. De Vries' work becomes of inestimable value, for it lists 48,000 words and terms. The author says, however "This dictionary of 48,000 entries cannot . . . make a claim to completeness. . . ." But he asks for corrections or additions. Here are a few of the latter culled from a 6-line paragraph in Fieber's Europäischen Hemiptera: Jochstücke, Schwiele, Keulig, Fühlerwurzel, Schienbeine; he defined Stirnschwiele as "frontal callus" only—in the Heteroptera, it should be "tylus." Apparently, Dr. De Vries did not have at hand that invaluable work "Terminologia Entomologica" of Julius Müller—at least, it is not listed among the references.

With regard to the references, in subsequent editions it might be well to add to these the date and publisher.

My own ideas of format and binding are exemplified in the "Glossary of Entomology." Of course, the McGraw-Hill Book Co. followed standard practice for dictionaries in the 8-point type, 2-column page. The binding might also be more flexible.

But these are minor matters, which in no way detract from the credit due the author for the endless, painstaking labor of preparing such a work as this; nor from the general excellence and usefulness of the dictionary. No lexicon or word-book will ever completely satisfy its maker—so many things undone stare him in the face when it is in print.

Every entomologist working with the German literature in his field should have the dictionary at his elbow for constant reference. He cannot do without it, even though he know German thoroughly. Its very modest price puts it within reach of all.

Both Dr. De Vries and the McGraw-Hill Company merit unstinted recognition and praise for this most excellent addition to the tools of the biologist. J. R. T.-B.

PROCEEDINGS OF THE SOCIETY.

MEETING OF NOVEMBER 10, 1938.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, November 10, 1938. President William T. Davis presided, calling the meeting to order at 8:10 P.M. Nine other members were present, *viz.*, Dr. Dietrich, Dr. Tulloch, and Messrs. Buchholz, Dietz, Engelhardt, McElvare, Shoemaker, Siepmann and Stecher; also eight visitors, Mr. W. S. McAlpine of Birmingham, Michigan; Messrs. John J. Bowe, John Elfstrom, Albert Gaul, John C. Pallister, and Miss Harlbut, Mrs. Dietrich, and Mrs. Pallister.

The minutes of the previous meeting were read and approved. An informal report was presented by the Treasurer.

Mr. McElvare showed a copy of the recently published List of the Insects of North Carolina, by Brimley. He also said that there is a record of the moth *Schinia tuberculum* being taken at Coram, Long Island, N. Y., on August 18, 1920, in the National Museum records, but it does not appear in the New York State List. Mr. McElvare himself went to Coram on August 28, 1938, and took a series of this moth. It is a day-flying species, and is found on the flowers of the yellow aster.

Mr. John Elfstrom reported finding the remains of a *Scaphinotus viduus* (Coleoptera-Carabidae) at Richmond Hill, Staten Island, New York, on September 25, 1938. He had previously reported the capture of a living specimen at the same locality.

The unusually warm autumn and its effect on insects was a point of interest discussed by various members. Up to the date of the meeting there had been no killing frost in the vicinity of New York City. A second brood of *Cynthia* was reported, but this brood probably does not propagate.

Dr. Tulloch reported that in one area on Long Island he had found *Anopheles* larvae very common, which were more numerous than any other species of mosquito. The common opinion is that *Anopheles* are no longer very common on Long Island.

Mr. Davis spoke on the Cicadas mentioned or described in his recent paper on this group, published in the Journal of the New York Entomological Society. This was his thirtieth paper on Cicadas. He illustrated his talk with specimens, showing also several specimens of the Tachinid fly, *Coenomyia pallida,* taken at Clove Valley, Staten Island, N. Y., and in Eastern Pennsylvania, in close association with emerging Cicadas. This fly has been known to feed on coleopterous larvae, but it has not definitely been seen feeding on Cicadas. Mr. Engelhardt also collected a species of *Coenomyia* at Palo Alto, near Chicago. Both speakers commented upon the characteristic and persistent odor of this fly, somewhat like that of slippery elm, which is communicated to the boxes and specimens with which it may be brought into contact.

Mr. Engelhardt exhibited specimens of the Satin Moth, *Stilpnotia salicis,* and the tent-caterpillar moth, *Malacosoma* species, which, he remarked, were encountered in enormous numbers swarming about the glaring blue argon lights, illuminating store windows on one of the principal streets in the city of Seattle, Washington, on a night in late July. They were an annoyance, causing passers-by to dodge and detour across the street to avoid contacts. The attraction of insects to lights of other colors, red, orange or white, it was ascertained, was almost negative. A more detailed note on this observation has been submitted for publication in the BULLETIN.

Mr. Engelhardt also showed a pair of the hawkmoth, *Smerinthus cerisyi,* from Seattle, found in copulation. The sexual color contrast is striking, the male very dark and the much larger female light tawny.

Returned to his home in Westchester Co., New York, Mr. Engelhardt noted during October the almost total absence of insects about the tungsten lights, now replacing so generally the former carbon lights, which used to afford such big hauls to collectors. An exception to this negative response was observed along the Bronx River Parkway, where the tungsten lights are suffused by globular, ground glass shades. Following a warm night, on the morning of October 15, numerous moths, beetles, etc., were seen resting on the poles and fixtures. The geometrid moth, *Ennomos magnarius* was most common, sometimes ten or more to a light. Next common was the lasiocampid moth, *Tolype velleda,* otherwise rarely encountered for some years past.

Mr. McAlpine commented briefly upon collecting conditions in Michigan. He said that a number of southern species follow the shore line of Lake Michigan northward. He said his chief interest was in the life history of butterflies, especially the metal marks, in which group very little has been done.

The meeting adjourned at 9:50 P.M.

CARL GEO. SIEPMANN,
Secretary.

MEETING OF DECEMBER 15, 1938.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum, on Thursday, December 15, 1938. President William T. Davis, presiding, called the meeting to order at 8:15 P.M. Ten other members were present, *viz.*, Dr. Dietrich and Dr. Tulloch, and Messrs. Buchholz, Dietz, Engelhardt, McElvare, Nicolay, Shoemaker, Siepmann and Stecher, also Messrs. John J. Bowe, A. T. Gaul, John C. Pallister, Richard F. Watt, and Mrs. Dietrich and Mrs. Pallister.

The minutes of the previous meeting were read and approved, and a brief report was presented by the Treasurer. A nominating committee, to consist of Mr. Shoemaker, as chairman, Dr. Dietrich, and Mr. Nicolay, was appointed by the president.

Mr. Siepmann exhibited specimens of the Histerid beetle, *Chelyoxenus xerobatis* Hubb. which is found in the nests of the Gopher Tortoise, and read an account of its habits from a paper by Henry G. Hubbard in Insect Life, Volume VI, p. 302–315, published in 1894. Mr. Siepmann commented that many species of Histeridae were found in the nests of mammals, birds, ants and termites.

Mr. William T. Davis exhibited a specimen of cockroach of large size, taken in the Bird House of the Bronx Park by Mr. George F. McKenna of the Boyce Thompson Institute. It was a specimen of *Leucophaea maderae* Fabr., the Madera Cockroach, and is a new record for New York State. The species is common in the West Indies, and is often found in dwellings. The Surinam Cockroach, another introduced species, is found in the Reptile House of the Bronx Park, but the males are seldom found. The male in Mr. Davis's collection is the only male taken in North America. It is possible that the males are born early in the year, and live but a short time, and this would account for their scarcity in collections.

Mr. Engelhardt spoke on his collecting trip to Alaska last summer. His paper will be published separately in the BULLETIN.

The meeting adjourned at 10:50 P.M.

CARL GEO. SIEPMANN,
Secretary.

Notice to Authors.—We have on hand a large number of long papers. We cannot accept more for publication before October or December of this year.—EDITOR.

EXCHANGES

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

DIURNAL LEPIDOPTERA.—Have many desirable western species to exchange, including *Argynnis atossa, macaria, mormonia, malcolmi, nokomis; Melitaea neumoegeni; Lycaena speciosa;* etc. Send lists. Dr. John A. Comstock, Los Angeles Museum, Exposition Park, Los Angeles, Calif.

BUY OR EXCHANGE: Pinned Microlepidoptera and papered Pieridae of North America. Full data with all specimens. Named material of all groups offered. Alexander B. Klots, College of the City of New York, New York City.

EXCHANGE OR FOR SALE.—*Catocala herodias* (Gerhardi), *Graptolitha viridipallens* and others. Wanted: Rare N. A. Macro-Lepidoptera. F. Lemmer, Lakehurst, N. J.

WANTED.—North American CHRYSIDIDAE for exchange or determination, with privilege of retaining duplicates. W. G. Bodenstein, Dept. Entomology, Cornell University, Ithaca, New York.

PENTATOMIDAE: Want to buy or exchange Petatomidae from the United States and Mexico. Herbert Ruckes, College of the City of New York, 17 Lexington Ave. N.Y.C.

ACALYPTRATE DIPTERA OF THE WORLD wanted for determination or in exchange for other insects. Geo. Steyskal, 23341 Puritan Ave., Detroit, Mich.

LOCALITY LABELS.—3½ or 4 point type; 40c per five hundred, 60c per thousand, 40c for each additional thousand, same type. Type labels on colored paper 10c extra. Good paper, clean work, no trimming. The Nature Co., Box 388, Lawrence, Kansas.

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CARL GEO. SIEPMANN GEO. P. ENGELHARDT

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The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

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BULLETIN

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NOTES ON THE DISTRIBUTION OF *PSEUDOMASARIS* AND ON THE FOODPLANTS OF THE MASARIDINAE AND GAYELLINAE (HYMENOPTERA, VESPIDAE).

By J. Bequaert, Museum of Comparative Zoölogy,
Cambridge, Mass.

1. Distribution of *Pseudomasaris*.

Records published and specimens received in recent years extend the area of several species. Only new localities are listed below, but the known general distribution is indicated. It is surprising that thus far only one species has been taken in Mexico.

1. *P. vespoides* Cresson.—Oregon: Goose Lake, Lake Co., 1 ♀ (Holleman).—California: Carrville, Trinity Co., 2,400 to 2,500 ft. (G. E. Bohart); San Benito, San Benito Co. (R. M. Bohart); Donner Lake, near Truckee, Nevada Co., 1 ♀ (G. P. Engelhardt); Lake Amanor, Mt. Lassen National Park, 1 ♀ and 1 ♂ (G. P. Engelhardt).—Idaho: Bear Lake Valley, Bear Lake Co., 2 ♂ and 3 ♀ (C. L. Hayward); Zaza, Nez Percé Co., 1 ♀, at flowers of *Pentstemon venustus* (F. W. Pennell); Brundage Mts., Valley Co., 1 ♂, at flowers of *Pentstemon payetensis* (F. W. Pennell); Lake Waha, Nez Percé Co., 2 ♀ at flowers of *Pentstemon venustus* (F. W. Pennell); Craters of the Moon, Butte Co., 7 ♀, at flowers of *Pentstemon cyaneus* (F. W. Pennell); Martin, Butte Co., 1 ♂, at flowers of *Pentstemon cyaneus* (F. W. Pennell).—Utah: La Sal National Forest, 1 ♂ (C. T. Brues).—Colorado: Mesa Verde, 6,500 ft., 1 ♀ (G. P. Engelhardt); Mt. Manitou, El Paso Co., 9,000 ft., 1 ♀ (Grace O. Wiley); Naturita, Montrose Co., 1 ♀, at flowers of *Pentstemon comarrhenus* (E. Payson).—Arizona: White Mesa near Kayenta, Navajo Co., 1 ♀ (C. T. Brues); southern rim of Grand Canyon, 1 ♂ (Margaret L. Cook).—Distribution: Oregon, California, Nevada, Idaho, Utah, Colorado, Arizona, New Mexico and South Dakota. It may be expected in Wyoming and Montana.

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2. *P. texanus* (Cresson).—*P. basirufus* Rohwer, *P. albifrons* Rohwer and the subsp. *neomexicanus* Rohwer are scarcely more than individual variants of *P. texanus* and certainly not specifically distinct.—TEXAS: 8 miles south by east of Lytle, Atascosa Co., with nest (Albert J. Kirn).—ARIZONA: Tempe, Maricopa Co., 1 ♂ (D. K. Duncan); Globe, Gila Co., 1 ♀ (D. K. Duncan).—Distribution: California, Arizona, Utah, New Mexico and Texas.

3. *P. maculifrons* Fox.—A fine series of both sexes of this species, taken by Mr. M. Cazier at Yermo, was sent to me by Mr. G. R. Ferguson, who pointed out that the females were *P. maculifrons*, while the males agreed with *P. rohweri* Bradley. One pair of the Yermo wasps was taken in copulation. Mr. Ferguson compared the females with the type of *maculifrons* at the California Academy of Sciences. It seems quite certain that *P. rohweri* was based upon the male of *P. maculifrons*. Moreover, Bradley recorded a female of *maculifrons* from Quartzite, Arizona, in the paper in which he described *rohweri* from the same locality.—CALIFORNIA: Yermo, San Bernardino Co. (M. Cazier); Mazowila, Inyo Co. (R. M. Bohart); Westgaard Pass Plateau, Inyo Co. (R. M. Bohart).—Distribution: California, Arizona and Lower California (Mexico).

4. *P. bariscapus* Bradley.—Known only from Arizona. Female unknown.

5. *P. phaceliae* Rohwer.—Known only from New Mexico.

6. *P. occidentalis* Cresson.—NEW MEXICO: Albuquerque or Mountainaire, 1 ♀ (C. H. Hicks).—KANSAS: Blue Rapids, Marshall Co. (about 40 miles north of Manhattan), several ♀, at flowers of *Pentstemon cobaea* (O. A. Stevens).—Distribution: New Mexico, Texas and Kansas. It may be expected in Oklahoma.

7. *P. marginalis* Cresson.—ALBERTA: Moraine, 1 ♂ (E. H. Strickland).—COLORADO: Long's Peak, several ♂ (Amer. Mus. Nat. Hist.). I have compared these Alberta and Colorado males with the male allotype and they agree in every respect.—Distribution: British Columbia (Kaslo), Alberta, Colorado and New Mexico. It will no doubt be found in several other Rocky Mountain States.

8. *P. zonalis* Cresson.—WASHINGTON: White River, Mt. Rainier, 1 ♀ (A. L. Melander); Paradise Park, Mt. Rainier, 1 ♀ (A. L. Melander).—OREGON: McKenzie Pass, Lake Co. (G. P. Engelhardt); Lake of Woods, Klamath Co., 4,950 ft. (H. A. Scullen).—IDAHO: Bear Lake Valley, Bear Lake Co., 1 ♂ (C. L. Hayward).—CALIFORNIA: Lake Tahoe, Placer Co. (R. M. Bohart); Rock Creek Lake, Inyo Co. (R. M. Bohart); Mammoth Lake, Mono Co. (G. E. and R. M. Bohart); Convict Creek, Mono Co. (R. M. Bohart).—Distribution: British Columbia, Washington, Oregon, Nevada, Idaho, Utah, Colorado and California.

9. *P. coquilletti* Rohwer.—California: Mt. Diablo, Contra Costa Co. (R. M. Bohart); Berkeley, Alameda Co. (R. M. Bohart).—Known only from California.

10. *P. wheeleri* J. Bequaert.—California: Independence, Inyo Co. (R. M. Bohart); Baker, San Bernardino Co., 1 ♂, March 15, 1935 (G. R. Ferguson).—Known only from California.

11. *P. edwardsii* Cresson.—California: Mt. Diablo, Contra Costa Co. (R. M. Bohart); Mammoth Lake, Mono Co., several ♀ and ♂ (G. E. and R. M. Bohart); Hot Creek, Mono Co. (R. M. Bohart).—Distribution: Washington, Nevada, Utah and California. It may be expected in Oregon and Idaho.

2. Foodplants of Masaridinae and Gayellinae.

From all trustworthy observations, the wasps of the subfamily Masaridinae are strictly vegetarian, both as larvae and as adults. The female wasp stores a mixture of honey (regurgitated nectar) and pollen (bee-bread) as food for the larvae. The mouthparts of the adults are eminently adapted to the gathering of nectar in flowers where it is deeply hidden, the ligula of the labium being unusually developed, retractile, and more or less deeply split into two glossae. The maxillae take no part in the formation of the proboscis, but the palpi are often reduced or rudimentary. The relative length of the "tongue," particularly of the terminal glossae, varies from one genus to another. It is particularly long in the North American *Pseudomasaris*. On the other hand, no special provision is made for the collecting and transport of pollen, which the female wasp merely gathers with the mandibles and carries in pellets in the mouth. In all Masaridinae I have examined, the few hairs of body and legs are simple, not branched as in the bees, and are of little or no assistance in the transport of pollen to the nest. Enough pollen, however, adheres to the body to make these wasps efficient pollinators in passing from flower to flower.

The morphology of the Masaridinae was discussed in an earlier article (1929, Psyche, XXXVI, pp. 72–76), where it was shown that these wasps exhibit a curious mixture of primitive characters and others that are highly specialized. It is noteworthy, for the present purpose, that, with the exception of the highly modified mouthparts, none of the characteristics of the Masaridinae is particularly correlated with their anthophilous habits. These wasps have not departed greatly, in structure, from their predacious ancestors.

The nesting habits also are essentially those of the solitary predacious Eumeninae. I have reviewed these in my earlier paper

(1929, *Loc. cit.*, pp. 78–80; additional notes p. 369), but a few supplementary observations will be given here. The nests, so far as known, are of two main types, both found also in the Eumeninae.

In *Ceramius* (including *Paraceramius* and *Ceramioides*), the female burrows a gallery in the soil, ending in a cavity in which oval cells of mud are built; the larva is fed from day to day with honey and pollen by the mother wasp; a chimney is usually built at the entrance to the burrow. The Australian species of *Paragia* and *Metaparagia* probably have similar habits. The only account with which I am acquainted is by C. A. Wilson (1869, Trans. Ent. Soc. London for 1869, Proc., pp. xvii-xviii). He states that, in the vicinity of Adelaide, *Paragia smithii* de Saussure[1] nests in a burrow in the soil, erecting a chimney at the entrance. He did not observe any insects or other food being brought in by the wasps.

Celonites, Masaris and *Pseudomasaris* build free mud nests, of one or more cells, attached to rocks or twigs. The mother wasp stores the cell completely with bee-bread above the egg and closes it before the egg hatches or when the larva is yet very young (mass provisioning). The earliest account of the nest of *Celonites abbreviatus* was by C. de Villers (1789, C. Linnaei Entomologia, III, p. 281), who observed it in southern France, but did not mention the larval diet.[2] The nest of the South African *C. andrei* was described by H. Brauns (1913, Ent. Mitt., Berlin-Dahlem, II, p. 206) and is similar to that of *C. abbreviatus*. The nests of *Pseudomasaris* are now known for four species: *P. vespoides* and *P. edwardsii* (described by Hicks, 1927, Canad. Entom., LIX, pp. 75–79; 1929, Canad. Entom., LXI, pp. 121–125; 1931, Bull. So. Calif. Ac. Sci., XXX, pp. 23–29); *P. occidentalis* (described by Hungerford, 1937, Jl. Kansas Ent. Soc., X, pp. 133–134); and *P. texanus*. Of the last-named species a nest was recently sent to me by Mr. F. M. Getzendaner. It was found, by Mr. Albert J. Kirn, about 8 miles south by east of Lytle, in northern Atascosa Co., Texas. It is a hard lump of clay, 35 mm. long, 20 mm. wide and 20 mm. thick (in the direction of the cells), attached to a twig passing through the middle. The nest seems to have comprised 15 cells, most of which had hatched. In one cell part of a female adult was found; in another, a dead male almost ready to hatch. All the cells are lined with a white, silky material. Inside they measure 18 by 4 mm. The openings of the hatched cells are all to one side of the nest. The only reliable account of the nesting habits of *Masaris* is by C. Ferton (1921, Ann. Soc. Ent. France, LXXXIX, (1920), pp. 372–374). He found in Algeria some mud nests built against rocks and stored with bee-bread above the egg. Although he did not see the builder nor breed out the wasps, he attributed these nests to *Masaris vespiformis* Fabricius, which he observed in the same neighborhood at flowers and gathering mud.[3] It is interesting to note that *Masaris* and *Pseudomasaris* have similar nesting habits. Morphologically also these two genera are very closely related, so that one may be tempted to regard *Pseudomasaris* as a mere subgenus of *Masaris*.

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[1] Wilson calls the wasp *"Paragia tricolor,"* but Smith's *tricolor* included two species: the female, from Perth, Western Australia, was true *tricolor;* while the male from Adelaide, was *Paragia smithii* de Saussure.

[2] He concludes his description of *C. abbreviatus* with the statement: "Nidus cylindraceus ramis mortuis tota longitudine annexus, exterius rufus."

All the Masaridinae of which the nest is known, have retained in their behavior another characteristic feature of the solitary predacious Vespidae. In the latter the female deposits the egg in the bottom of the cell before bringing in any of the insect larvae on which the wasp larva will feed. Likewise, in the Masaridinae, after the cell is built, the egg is laid in the bottom before pollen and honey are gathered. In *Ceramius,* the larva is fed from day to day, until fullgrown. In *Celonites, Masaris* and *Pseudomasaris* the food mass is stored rapidly above the egg or young larva and the cell sealed. This procedure is in sharp contrast with that of the solitary nesting bees (Apoidea) which, with very few exceptions (such as certain species of *Allodape*), store the cell completely with bee-bread before laying the egg; and in most cases the egg is laid on top of the provisions, although *Ceratina* manages to shove it to the bottom of the cell.

The larval diet is definitely known only for *Celonites, Ceramius, Masaris,* and *Pseudomasaris*. Of the other Masaridinae, the adults of *Quartinia, Quartiniella, Jugurtia* (including *Ceramiellus* and *Masariella*), and *Trimeria* have been observed visiting flowers, but the nests are as yet unknown. No ethological data are available for *Paragia* (except for the brief account copied above), *Metaparagia,*

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[3] F. D. Morice's earlier brief statement (1900, Ent. Mo. Mag., XXXVI, p. 168) that he saw a female of *Masaris vespiformis* near Cairo, Egypt, "enter a simple burrow in the flat sand," was, I believe, due to some error. The burrow was not further investigated.

Ceramiopsis and *Microtrimeria.* It is, nevertheless, reasonably certain that the Masaridinae will all prove to be strictly vegetarian, as larvae and as adults.

The Masaridinae are, moreover, not the only subfamily of solitary Vespidae with a vegetarian diet, since the Gayellinae have also been shown to feed the larvae on bee-bread. The habits of *Gayella eumenoides* Spinola have been worked out in detail by H. Janvier (Frère Claude-Joseph) (1930, Ann. Sci. Nat., Zool., (10) XIII, pt. 2, pp. 350–354). This wasp lives in the Andes of Chile, between the altitudes of 800 m. and 3000 m.[4] Here it builds lumps of clay against rocks, containing several rows of three or four cells placed in a linear series. The female lays the egg in the bottom of the cell and suspends it to a thread from the ceiling. She then fills the cell with a very liquid bee-bread, a short distance beyond the egg, and closes the cell (mass provisioning). H. Janvier claims that only honey is stored, no pollen. But, as the larva could scarcely grow on pure honey (carbo-hydrates) alone, it is more probable that there is some admixture of pollen, although the resulting bee-bread may be semi-liquid. It is interesting to note that, notwithstanding the strictly anthophilous habits, *Gayella* has retained the more primitive short tongue of the predacious solitary Vespidae.[5]

Assuming that all Masaridinae and Gayellinae are restricted to a diet of pollen and honey, their relations with flowers deserve to be investigated more carefully. It is possible that, as in the case of the Apoidea (or bees), the evolution of these wasps may have influenced that of certain types of flowering plants. If, however, such were not the case, the Masaridinae and Gayellinae might have to be regarded as mere opportunists, who took advantage of the favorable conditions created by the evolution of bees and flowers.

As the flower relations of the Masaridinae were inadequately treated in my earlier paper (1929, Psyche, XXXVI, pp. 77–78), I am now bringing together all information scattered in the literature, as well as some unpublished data.[6] It is to be hoped that these notes may spur on to further and more complete observations. The identification of the flower as to species is essential. The behavior of the wasps should be noted in each case; particularly whether the flower is visited for nectar, for pollen, or for both; how regular the visits of the wasps are to a particular species of flower; and what relative importance visits by wasps have as compared with visits by other insects.[7] The botanist will have to investigate whether any structures of the flowers favored by Masaridinae, might be construed as adaptations to pollination by these wasps.

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[4] Brèthes records it also from the Province of Mendoza, Argentina.

[5] I have shown (1928, Ann. Mag. Nat. Hist. (10) II, pp. 143–145) that the North and Central American *Paramasaris fuscipennis* Cameron is very closely allied to *Gayella.* It will be interesting to observe whether *Paramasaris* also stores bee-bread for the larva.

[6] I am particularly indebted to Dr. F. W. Pennell, the well-known student of the Scrophulariaceae, who at my request collected insects at the flowers of *Pentstemon.*

Trimeria buyssoni Brèthes.—Verbenaceae: *Lippia nodiflora* (Linnaeus) (Argentina.—P. Jörgensen).

T. howardi Bertoni.—Portulacacae: *Talinum patens* (Jacquin) (Paraguay.—A. de Winkelried Bertoni).

Ceramius fonscolombii Latreille.—Resedaceae: *Reseda* sp. (Algeria.—O. Schmiedeknecht).

Jugurtia algerica (v. Schulthess).—Umbelliferae: *Ammi visnaga* Lamarck (Algeria.—J. Bequaert). The *Jugurtia* taken on this flower by A. E. Eaton, at Biskra, may have been this species or the next.

J. biskrensis J. Bequaert.—Umbelliferae: *Ammi visnaga* Lamarck (Algeria.—J. Bequaert).

J. oraniensis (Lepeletier).—Umbelliferae: *Bupleurum maritimum* Linnaeus (Algeria.—A. Dours); *Daucus setifolius* Desfontaines (Algeria.—A. E. Eaton). Malvaceae: *Malva sylvestris* Linnaeus (Algeria.—A. E. Eaton). Convolvulaceae: *Convolvulus arvensis* Linnaeus (Algeria.—A. E. Eaton). Boraginaceae: *Echium* sp. (Algeria.—A. E. Eaton). Scrophulariaceae: *Scrophularia* sp. (Algeria.—O. Schmiedeknecht). Compositae: *Centaurea* sp. (Algeria.—O. Schmiedeknecht); Dours also observed it on unidentified Compositae. Eaton's records were published under *J. numida* de Saussure, a synonym of *J. oraniensis.*

Celonites afer Lepeletier.—Umbelliferae: *Bupleurum maritimum* Linnaeus (Algeria.—A. Dours). Boraginaceae: *Echium* sp. (Morocco.—T. D. A. Cockerell); *Echium confusum* de Coincy (Algeria.—J. Bequaert); *E. italicum* Linnaeus (Algeria.—A. E. Eaton); *E. humile* Desfontaines (Algeria.—A. E. Eaton). Labiatae: *Teucrium aureum* Schreber (S. France.—F. Bernard).

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[7] F. E. Clements and F. L. Long (1923, Carnegie Inst. Washington Publ. 336, pp. 65–78) have investigated some of these points for *P. vespoides* and species of *Pentstemon.* Unfortunately, they seem to have used the name *Vespa germanica* for *P. vespoides* in part of their account.

Compositae: *Microlonchus salmanticus* de Candolle (Algeria.—A. E. Eaton); Dours also observed it on unidentified Compositae. Eaton's records were published under *C. fischeri,* but the Algerian wasps were really *C. afer.*

C. abbreviatus (Villers).—Labiatae: *Calamintha alpina* (Linnaeus) (Italy.—E. Loew); *Teucrium montanum* Linnaeus (S. Germany.—H. Friese). Crassulaceae: *Sedum* sp. (S. Germany.—O. Schmiedeknecht).

Quartinia.—All species seem to favor Compositae, as noted by T. D. A. Cockerell, H. Brauns and R. E. Turner in South Africa, and by R. Benoist in North Africa (1930, Bull. Soc. Sci. Nat. Maroc, IX, (1929), p. 93). Cockerell (*in. litt.*) mentions particularly the flowers of *Microcodon* and *Cotula.* In South Africa R. E. Turner found some of the species also at flowers of *Mesembryanthemum* (Aizoaceae).

Q. dilecta Ed. André.—Compositae: *Picridium tingitanum* Desfontaines (Algeria.—A. E. Eaton).

Q. major Kohl.—Compositae: *Asteriscus maritimus* Moench (Algeria.—A. E. Eaton); *Chrysanthemum myconis* Linnaeus (Algeria.—J. Bequaert); *Calendula* sp. (Algeria.—O. Schmiedeknecht).

Q. cincta Benoist.—Compositae: *Anacyclus* sp. (Morocco.—R. Benoist).

Q. poecila v. Schulthess.—Compositae *Berkheya* sp. (Damaraland.—R. E. Turner).

Q. thebaica R. du Buysson.—Compositae: *Senecio* sp. (Egypt.—F. D. Morice).

Quartiniella.—According to R. E. Turner, the two known species visit Compositae in South Africa.

Pseudomasaris vespoides.—Liliaceae: *Calochortus gunnisonii* Watson (Colorado.—F. E. Clements and F. L. Long). Rosaceae: *Prunus melanocarpa* (A. Nelson) (= *demissa* of authors) (Colorado.—F. E. Clements and F. L. Long); *Opulaster opulifolius* (Linnaeus) (Colorado.—F. E. Clements and F. L. Long); *Rubus deliciosus* James (Colorado.—F. E. Clements and F. L. Long); *R. strigosus* Michaux (Colorado.—F. E. Clements and F. L. Long). Geraniaceae: *Geranium caespitosum* James (Colorado.—F. E. Clements and F. L. Long). Boraginaceae: *Mertensia ciliata* Torrey (= *sibirica* Don) (Colorado.—F. E. Clements and F. L. Long). Labiatae: *Monarda fistulosa* Linnaeus (Colorado.—F. E. Clements and F. L. Long). Scrophulariaceae: *Pentstemon* sp. (pollen-eating, New Mexico.—W. P. Cockerell; and Colorado.—T. D. A. Cockerell); *Pentstemon acuminatus* Douglas (Colorado.—

C. H. Hicks); *P. glaber* Pursh (*Colorado.*—F. E. Clements and F. L. Long; J. Bequaert); *P. glaucus* Graham (Colorado.—F. E. Clements and F. L. Long); *P. gracilis* Nuttall (Colorado.—F. E. Clements and F. L. Long); *P. venustus* Douglas (Idaho.—F. W. Pennell); *P. payetensis* Nelson and Macbride (Idaho.—F. W. Pennell); *P. cyaneus* Pennell (Idaho.—F. W. Pennell); *P. heterophyllus* Lindley (California.—C. H. Hicks); *P. spectabilis* Thurber (California.—A. Davidson); *P. comarrhenus* A. Gray (Colorado. —E. Payson); *P. secundiflorus* Bentham (Colorado.—F. E. Clements and F. L. Long).

P. texanus.—Papilionaceae: *Astragalus* sp. (New Mexico.—C. F. Baker). Rosaceae: "On plum" (as *P. albifrons;* New Mexico.—T. D. A. Cockerell).

P. phaceliae.—Hydrophyllaceae: *Phacelia* sp. (New Mexico.—T. D. A. Cockerell); *Phacelia neomexicana* Thurber (New Mexico. —J. R. Watson).

P. occidentalis.—Scrophulariaceae: *Pentstemon cobaea* Nuttall (Kansas.—O. A. Stevens).

P. marginalis.—Hydrophyllaceae: *Phacelia heterophylla* Pursh (Colorado.—J. Bequaert).

P. coquilletti.—Hydrophyllaceae: *Eriodictyon crassifolium* Bentham (California.—E. P. Van Duzee).

P. wheeleri.—Hydrophyllaceae: *Eriodictyon tomentosum* Bentham (California.—W. M. Wheeler).

P. edwardsii.—Hydrophyllaceae: *Phacelia* sp. (California.—W. M. Wheeler; P. H. Timberlake).

Masaris vespiformis Fabricius.—Labiatae: Undetermined species of this family with violet flowers and long corollar tube (Palestine.—Enslin). Boraginaceae: *Echium* sp. (Algeria.—C. Ferton; Egypt.—F. D. Morice).

Gayella eumenoides Spinola.—Rosaceae: *Quillaja saponica* Molina (Chile.—H. Janvier; P. Herbst). Anacardiaceae: *Schinus dependens* Ortega (Chile.—H. Janvier). Compositae: *Baccharis* sp. (Chile.—H. Janvier).

Food-plant of a Coreid Bug.—The big coreid *Thasus acutangulus* Stål is a common species in Arizona, on mesquite (*Prosopis velutina*). It feeds on the seed-pods.—J. R. de la Torre-Bueno, Tucson, Ariz.

THE ALLOTYPE OF CALOSATURNIA ALBOFASCIATA (LEPIDOPTERA, SATURNIIDAE).

By John Warren Johnson, Berkeley, California.

In June, 1938, in this Bulletin (Volume 33, No. 3) was published a description of the new Saturniid species, *Calosaturnia albofasciata* Johnson, the description being based upon two specimens from different regions of central California. Of these two specimens the sex of only one, the female holotype, was determinable. At that time no further information with regard to this species was available other than the knowledge of the localities where they had been collected. Since that time through the efforts of Mr. Hooton of Clearlake Highlands, and of Mr. Charles Machaboeuf of Kelseyville, additional specimens are now available, and it is possible to further characterize the species with a description and figure of the male *Calosaturnia albofasciata.* A figure of the female is included also to allow ready comparison.

The writer is much indebted to the courtesy of Mr. Machaboeuf who has loaned a male moth for this description and, further, presented this male to the collection of the California Academy of Sciences. The male, which is described below as the allotype, together with the female holotype presented by Mr. Hooton, will make a pair of this species available to lepidopterists for further study and comparison.

The male *C. albofasciata* is one of three specimens that were bred from three similar larvae found on *Ceanothus cuneatus* by Mr. Machaboeuf in company with Mr. Hooton in Lake County on May 23 and 28, 1938. The larvae pupated shortly thereafter in compact small cocoons spun on the twigs of the foodplant, the moths emerging subsequently in October. The imagos consisted of two males and one female.

A comparison of the figures and of the description of male and female of the species reveals the decided sexual dimorphism that exists in the species. The female emerging from one of the cocoons was identical with the female holotype collected by Mr. Hooton. The females are gray-brown with white-banded wings. The males, however, resemble very closely the general color pattern of *Calosaturnia mendocino,* having only the white bar from the ocellus to the inner margin on the primaries in common with the females, and likewise the suggestion, by the small patch of scales at the inner angle, of the submarginal band of the female. Because of this difference between the sexes, a detailed description of the male is given, thus characterizing the species fully. May it be noted also, that the hatching of the males established the sex of the paratype specimen to be female.

Calosaturnia albofasciata Johnson

Allotype: male sex; wing expanse, 37 mm.; like a diminutive male *Calosaturnia mendocino* Behrens in general appearance, but differing very decidedly by the presence of the discontinuous white bar extending from the ocellus on the forewing to the inner margin, and in the very bright orange hindwings, which contrast with the more yellow-orange hindwings of *mendocino.*

Head dark brownish-black, clothed with short mouse-colored hairs and scales and long fine dark brownish-black hairs, these latter closely set around the antennal bases and on the fronto-clypeus, where they are directed forward in two loose tufts before the eyes, and downward over the anterio-ventral aspect of the head; eyes visible; head appressed against the thorax.

Antennae proportionately large, 8 mm. in length, almost as large as those of male *mendocino,* bi-pectinate, the flagellum light brown, the pectinations and sensory hairs black, the pectinations more slender than in *mendocino,* the antennae, therefore, less dense, the antennal outline ovate proximally, becoming acuminate distally,—contrasting to the uniformly ovate antennal outline of *mendocino.*

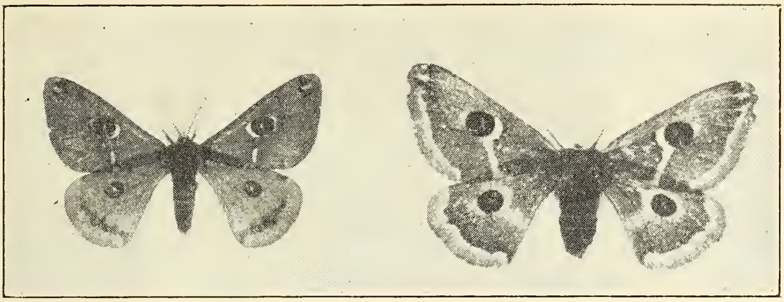
Thorax—dorsal surface: an anterior collar of white hairs between the wing bases of the primaries; the mesonotum and tegulae bearing shorter, dark-gray hairs and long silken red-brown hairs, these latter darker anteriorly at their bases, defining the posterior margin of the collar,—becoming brighter posteriorly and distally, spreading over the wing bases and thorax dorsum; the meso-postnotum bearing long fine dark-gray hairs spreading over the base of the abdomen.

Thorax—ventral surface: clothed with numerous long fine dark-gray hairs, anteriorly black hairs and a few white hairs, and posteriorly dull red hairs, spreading thickly against the wing bases.

Legs: femora clothed with long fine dark gray hairs, the first pair bearing also long dull red hairs; tibiae and tarsi clothed dorsally with long silken dull red hairs and ventrally with light brown hairs.

Abdomen: clothed dorsally with fine dark-gray hairs and scattered closely appressed scales of same tint; ventrally clothed with similar fine long dark-gray hairs and long dull red hairs, the latter forming indefinite longitudinal patches of dull red along each latero-ventral aspect of the abdomen.

Wings—superior surfaces. Primaries: of a tint similar to that of male *mendocino* primaries, a chocolate brown color; proximal one-half of costal margin clothed with black and white scales and hairs giving a pepper-salt gray appearance; the apical markings consisting of an anterior small black patch of scales bordered proximally and distally by pale blue scales, posteriorly the black with an increasing admixture of red scales and extending to and defining proximally the patch of white scales, the red scales most numerous surrounding the white patch and extending toward the apex of the wing; a triangular patch of white scales against the distal side of the ocellus; a broad crescent of white defining the ocellus proximally, scattered white scales discontinuously connecting the crescent with the white bar extending from the Cubital nervule to the inner margin, along which the bar spreads slightly basally; the crescent, white scales, and bar defined proximally by black scales; a small spot of light brown scales at the inner angle of the wing, defined proximally by irregular black scaling extending from the inner angle somewhat basally along the inner margin; the ocellus oval, a central very small hyaline space, the proximal half of the ocellus a series of concentric crescents, —centrally against the hyaline space a black crescent, this included by a light yellow-brown crescent, the latter included by a black crescent bearing a crescent of light blue scales, the black crescent defined proximally by a row of chocolate brown scales; the half of the ocellus distal to the hyaline space a mixture of black and brown scales, the brown scales darker centrally and lighter outwardly,—the black scales forming an ill-defined border around the distal half of the ocellus; the base of the wing with a few dark-gray scales overlaid by chocolate-tinted hairs; fringes of outer margin dark-gray. Secondaries: bright burnt-orange; a submarginal black band, incomplete across the radial nervules, extending from costal to anal margins; the ocellus smaller than that in primaries, almost round, a central hyaline space, surrounded by a black ring bearing a few brown scales on its distal half, surrounding the black ring a ring of yellow-brown scales, this within the outer ring of black bearing on its proximal half a crescent of light blue scales; base of wing with a few dark-gray scales; anal margin with long fine dark-gray hairs; fringes of outer margin dark-gray.



Calosaturnia albofasciata Johnson. Left figure, male allotype, superior surface; right figure, female holotype, superior surface. Both about natural size.

Wings—inferior surfaces. Primaries: bright orange, costal margin with dark gray scales mixed with light brown scales, becoming lighter apically; apices light brown; base and inner margin with pale brown hairs; a few light brown scales at the inner angle, defined proximally by black scales; the apical markings anteriorly a mixture of black, blue, and red scales, the red scales most numerous distally, posteriorly a patch of white scales divided by brown scaling on the nervule and surrounded by black and red scaling, the red scales most numerous posteriorly; the ocellus differing from its expression on the superior surface, a hyaline space situated eccentrically on the proximal side of the central black spot, the black spot within a ring of light brown scales, this ring included within the outer ring of black, the outer blackring bearing a crescent of blue scales on its proximal half. Secondaries: orange, less bright than superior surface by reason of a scattering of light brown scales over the wings; a patch of red and black scales near the outer angle on the costal margin; a few black scales at the anal angle; a faint submarginal band of brown scales replacing the black band of the superior surface; the ocellus somewhat obscured, a central hyaline space in a ring of scattered black scales, this surrounded by light brown scales, an indefinite outer ring of black scales bearing proximally a discontinuous crescent of blue scales; posterior to the ocellus scattered black scales extending to the anal margin, and extending more widely spaced towards the base of the wing; base of the wing and anal margin with long light- and dark-gray hairs.

Larva collected May 23rd or 28th, 1938, on *Ceanothus cuneatus* in Lake County, California, by Mr. Charles Machaboeuf of Kelseyville, California. Moth emerged October 21, 1938; presented by the courtesy of Mr. Machaboeuf to the California Academy of Sciences, San Francisco, California; deposited as Type Number 4809.

Duplication of Antennae in the Diptera.—Two abnormalities in the antennal structure of flies which have recently come to my observation should be worthy of record. A male specimen of *Hydrophorus gratiosus* Aldrich (Dolichopodidae) taken at Fort Collins, Colo., July 16, 1937 (James), has two complete aristas on the left antenna. What is evidently the additional one rises behind, and therefore lies above, the normal one; it is somewhat more slender, but otherwise of normal structure. The right antenna is of the usual form.

A male specimen of *Odontomyia hoodiana* Bigot (Stratiomyidae), from Mt. Diablo, Calif., April 24, 1937 (B. E. White), sent to me by Mr. Mont A. Cazier, has an additional right antenna just inside the normal one. I am assuming that the inner antenna is the extra one, because it is somewhat shorter than the other two; it is, however, otherwise of normal construction. The true right antenna is somewhat pushed outward; its basal segment lies very close to that of the additional antenna, but is distinctly separated for its entire length.—MAURICE T. JAMES, Ft. Collins. Colo.

ADDITIONS AND CORRECTIONS TO "A SYNOPSIS OF THE HEMIPTERA-HETEROPTERA OF AMERICA NORTH OF MEXICO," PART I.

By J. R. de la Torre-Bueno, Tucson, Ariz.

Of all human effort it may be said that strive as we may perfection eludes us. Here are additions to my Synopsis (Ent. Am. XIX; pp. 141–306, 1939), and a material correction.

Late knowledge of the paper by Harris and Johnston (see Bibliography herein) has made necessary the complete recasting of the entire subfamily Graphosomatinae (p. 197) as follows; and the addition of a new genus:

Subfamily 1—**Graphosomatinae** Jakovlev 1884.

Tribe *PODOPINI* Dallas 1851.

Key to Genera.

1. Antennae *4-segmented;* tylus exceeding juga; anterolateral margins of the pronotum explanate, reflexed; (juga flattened; antennal segment I not reaching the apex of the head; bucculae reaching nearly to the base of the head, gradually but distinctly elevated posteriorly; rostrum reaching midventer; anterolateral margins of the pronotum serrulate; femora unarmed, tibiae faintly sulcate; venter *without* a median furrow or opaque areas, angles of abdominal segments *not* spinose; no metasternal carina). I. *Allopodops* Harris & Johnston 1936

Antennae *5-segmented;* tylus *not* exceeding juga; anterolateral margins of the pronotum *not* explanate 2

2. Juga flattened, thin a little longer than the tylus but not contiguous; antennal tubercles prominent beyond the sides of the head, armed on the outer side with a curved spine; (angles of the pronotum armed with a short acute tooth; without a metasternal carina). III. *Podops* Laporte 1832

Juga convex, much longer than the tylus and contiguous before it; antennal tubercles scarcely prominent beyond the sides of the head, unarmed 3

3. Anterior angles of the pronotum armed with a prominent denticulate rounded or quadrangular lobe; *without* a metasternal carina .... II. *Oncozygia* Stål 1872

Anterior angles of the pronotum *without* lobes; *with* a distinct metasternal carina .... IV. *Weda* Schouteden 1905

Genus I. *Allopodops* Harris & Johnston 1936

This is a monotypic genus, the principal characters of which (taken from the original description) are set forth in the generic key. Its one species is

Allopodops mississippiensis Harris & Johnston 1936

The structural characters of the species following are taken from the original description: Coarsely and regularly punctured with a whitish hair arising from each puncture, the hairs long and semi-erect on the pronotum and scutellum, shorter, finer and prostrate elsewhere; antennal segment IV swollen from the base, proportion of the segments: : 7: 9: 7: 13; rostral segment I not exceeding the bucculae, II enlarged from base, rather strongly laterally compressed, extending to the middle of the mesosternum, III reaching the base of the abdomen, proportions : : 15: 22: 18: 17; scutellum with an oblique impression on each side behind the base, producing a triangular, somewhat elevated area, the apex of the triangle continued to the middle of the disc as a smooth median carina; ventral segment V deeply angularly emarginate posteriorly, VI one-half longer at the sides than at the median length; length, 5.03 mm., width, 2.50 mm. (at humeri), 2.86 mm. (at abdomen).

This species is known only from the holotype female taken at Wiggins, Mississippi, by H. G. Johnston.

In the Pentatominae there are two corrections in keys. A key to genus *Coenus* is called for by the description of a new genus in the paper mentioned, p. 378, as follows:

Genus XI. *Coenus* Dallas 1851

KEY TO SPECIES

A. Antennal segment II about three-quarters the length of III; apex of corium subtruncate; genital plate of male broadly emarginate, *with* a distinct median triangular tooth; length, 7.5–10.5 mm., width, 4.5–6.5 mm.
delius Say 1832
(For distribution see Synopsis, p. 224)

B. Antennal segment II about three-fifths the length of III (antennal proportions : : 16: 17: 30: 25: 34); apex of the corium broadly obtusely rounded; genital plate of the male evenly rounded, *without* a tooth at middle; length, 11–11.6 mm., width, 6.5–6.8 mm.
inermis Harris & Johnston 1936
Arkansas, Oklahoma.

More regrettable is the crass mistake in the Key to *Rhytidolomia, Liodermion* and *Chlorochroa* (pp. 213–217). Couplet 5 on p. 214 should read as follows:

5. Rostral segments II and III *equal or subequal,* (IV shorter than III); form more elongated and produced anteriorly (*Rhytidolmia* Stål) *6*
Rostral segment III *shorter* than II; form proportionally broader and less produced anteriorly (*Chlorochroa* Stål) *9*

The above, however, is correctly stated in the general key to the genera of Pentatomini, p. 207 and following.

These errors are regretted by no one so much as by the unhappy author.

Any other corrections or improvements will be published as promptly as possible, as they reveal themselves.

Addition to

BIBLIOGRAPHY

Harris, H. M., and **H. G. Johnston.** 1936. A New Genus and Species of Podopidae and a New Coenus. Iowa State College Journal of Science, X: 377/380.
Describes *Allopodops* (p. 377); *A. mississippiensis* H. & J. (Mississippi, p. 278); *Coenus inermis* H. & J. (Arkansas, Oklahoma, p. 378, plate I).

ADDITIONS TO ANNOTATED LISTS OF INSECTS REARED FROM ELM BARK AND WOOD.

By Clarence H. Hoffmann, U. S. Department of Agriculture, Bureau of Entomology and Plant Quarantine.

Since early in 1935, members of the Morristown, N. J., research laboratory of the Bureau of Entomology and Plant Quarantine concerned with the Dutch elm disease project, under the direction of C. W. Collins, have studied various species of insects found breeding in or associated with other insects in elm to determine their actual or potential rôle as carriers of the dreaded elm fungus (*Ceratostomella ulmi* (Schwarz) Buisman). Two of the bark beetles, namely, *Scolytus multistriatus* (Marsh.) and *Hylurgopinus rufipes* (Eich.), have already been proved important agents of inoculation of this fungus. Transmission studies are now in progress on certain other species that commonly breed in elm, and, as time passes and more is learned about the biology of additional species, they too undoubtedly will be subjected to careful tests.

It appears that we must not only study those species likely to transmit the fungus to living trees, but also devote some time to those species that attack or are associated with cut or dead elm wood. It is conceivable that these insects, predators and parasites included, may come in contact with coremia of the fungus in barkbeetle galleries and subsequently contaminate other insect galleries heretofore free of the pathogene, thus producing reservoirs of the fungus. Moreover, the latter galleries might be those of proved barkbeetle vectors of the fungus, and the emerging adults so contaminated might inoculate healthy elm trees.

For the sake of brevity the list of elm insects presented here includes only those species not recorded by Pechuman (1937) and Kaston (1938), unless the original records emanated from the Morristown laboratory. The list has been confined to those species actually breeding in elm bark and wood or to those associated with them. As already inferred, most of the records are based upon rearings or observations made by men of the laboratory. Others, however, have been supplied by men of the same Bureau concerned with field work now under the direction of E. G. Brewer. The specimens have been determined by specialists[1] whose initials are shown in double parentheses following the name of the species which they determined. Because the initials of Messrs. Gahan and Gurney are identical, their surnames are given in full. Species unacknowledged were determined by the writer.

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[1] F. Andre, H. S. Barber, M. W. Blackman, A. G. Böving, L. L. Buchanan, August Busck, E. A. Chapin, R. A. Cushman, W. S. Fisher, A. B. Gahan, C. T. Greene, A. B. Gurney, D. G. Hall, W. Middleton, H. B. Mills, C. F. W. Muesebeck, D. Ries, R. A. St. George, and G. A. Sandhouse.

COLLEMBOLA.

Entomobryidae.

Entomobrya spp. ((H.B.M.)). Specimens of this species were reared from cut elm 14 to 16 months old from East Stroudsburg, Pa., emergence occurring from May to July.

CORRODENTIA.

Psocidae.

Psocus inornatus Aaron ((A.B.Gurney)). One specimen emerged in July from cut elm 16 months old from East Stroudsburg, Pa.

Psocus sp., near *quaesitus* Chapman ((A.B.Gurney)). Many specimens reared in June from elm wood collected at Union, N. J. Large numbers of this species were also reared during the summer and fall months from cut elm 15 to 24 months old from East Stroudsburg, Pa.

THYSANOPTERA.

Phlaeothripidae.

Hoplothrips karnyi major (Hood) ((F.A.)). A few specimens emerged in October from material collected at Plainfield, N. J., and East Stroudsburg, Pa.

COLEOPTERA.

Orthoperidae.

Molamba fasciata (Say) ((W.S.F.)). Adults issued in August from parts of an elm tree cut at Millburn, N. J., the preceding May.

Staphylinidae.

Atheta sp. ((E.A.C.)). Emerged during March from branch collected the preceding year in Essex County, N. J.

Histeridae.

Platysoma lecontei Mars. ((H.S.B.)). One adult found in September in a copper sulfate treated elm stump at West Caldwell, N. J. Another specimen was obtained from a similarly treated elm tree heavily infested with barkbeetles and borers from Radburn, N. J.

MALACHIIDAE.

Pseudebaeus sp. ((H.S.B.)). Two adults from the latter source given above.

CLERIDAE.

Enoclerus quadriguttatus (Oliv.) ((E.A.C.)). Reared from elm from Westfield, Mass. (August), Morristown, N. J. (August), and Athens, Ohio (May). Since the logs from Massachusetts were also heavily infested with *Hylurgopinus rufipes* (Eich.), the clerid is undoubtedly a common predator of this barkbeetle.

Neichnea laticornis (Say) ((E.A.C.)). An adult of this species was observed feeding upon a beetle of *Scolytus multistriatus* (Marsh.) at Millburn, N. J.

Chariessa pilosa (Forst.) ((E.A.C.)). A very common elm insect reared from elm collected at widely separated localities in New Jersey as well as from Philadelphia, Pa., Athens, Ohio, and Indianapolis, Ind. Adults of this predator issue during the spring and summer. Felled elm trees a few months old contained larvae of this species associated with larvae of *Saperda tridentata* Oliv., *Xylotrechus colonus* (F.), *Neoclytus acuminatus* (F.), and *Chrysobothris femorata* (Oliv.).

MORDELLIDAE.

Tomoxia bidentata (Say) ((H.S.B.)). Reared in June from old, rather punky elm wood from Convent and Long Branch, N. J.

Mordellistena sp. ((H.S.B.)). One adult emerged in June from Morristown, N. J., material.

PYROCHROIDAE.

Dendroides concolor Newm. ((H.S.B.)). A few specimens reared from elm cut 18 months at Morristown, N. J.

ELATERIDAE.

Parallelostethus attenuatus (Say) ((A.G.B.)). Larvae collected in March in elm stump at Plainfield, N. J.

Elater sp. ((A.G.B.)). Several larvae taken in February in bark of dead elm tree at East Stroudsburg, Pa.

Melanotus decumanus (Er.) ((W.S.F.)). A single adult issued in June from elm wood collected at Morristown, N. J.

BUPRESTIDAE.

Chalcophorella campestris (Say) ((W.S.F.)). One adult, Athens, Ohio, issued in May.

OSTOMIDAE.

Airora cylindrica (Serv.) ((W.S.F.)). One specimen, Indianapolis, Ind., emerged in May.

CUCUJIDAE.

Catogenus rufus (F.) ((W.S.F.)). One adult collected in June in dead elm wood at Indianapolis, Ind.

Laemophloeus sp. ((W.S.F.)). One example, unlike the common *L. fasciatus* Melsh. in appearance, issued in March from elm wood collected in Essex County, N. J.

EROTYLIDAE.

Megalodacne fasciata (F.) ((W.S.F.)). Specimens taken in May under elm bark at Lafayette, N. J., and in September under elm bark at Parkersburg, W. Va.

MYCETOPHAGIDAE.

Mycetophagus sp. ((A.G.B.)). Larvae found in December in elm bark at Towaco, N. J.

Litargus balteatus Lec. ((W.S.F.)). Reared from elm wood collected at Chester, N. Y.

COLYDIIDAE.

Colydium lineola Say ((W.S.F.)). An adult was taken in February in a barkbeetle gallery containing adults of *Xyloterinus politus* Say deep in the wood of a dying elm tree which had been treated with copper sulfate.

TENEBRIONIDAE.

Hoplocephala bicornis (F.) ((E.A.C.)). Many adults collected under elm bark in February at Raritan, N. J.

Platydema excavatum Say ((E.A.C.)). One adult taken under elm bark in September at Amherst, Mass.

Platydema ruficorne (Sturm) ((E.A.C.)). Adults collected under elm bark in September at Ryle, Ky.

Doliema pallida (Say) ((E.A.C.)). One specimen found under elm bark in February at Portsmouth, Va.

Merinus laevis (Oliv.) ((R.A.St.G.)). Larvae found in elm during May at Indianapolis, Ind.

Xylopinus aenescens Lec. ((E.A.C.)). A larva collected in dead elm on April 11 at Griggstown, N. J., was subsequently isolated in a salve box with small particles of elm wood in the laboratory. Pupation occurred on April 25 and the adult emerged on May 4.

Xylopinus saperdioides (Oliv.) ((E.A.C.)). Adults of this species issued in the spring from dead elm wood collected at Liberty Corner, Springdale, Mt. Hope, and Bloomfield, N. J.

Idiobates castaneus (Knoch) ((E.A.C.)). One specimen, Indianapolis, Ind., issued in May.

ANOBIIDAE.

Catorama nigritulum (Lec.) ((W.S.F.)). Larvae of this species were noted in the outer wood of a debarked elm stump about a year old at Millburn, N. J. Adults emerged from infested material from May to June.

BOSTRICHIDAE.

Xylobiops basilare (Say) ((W.S.F.)). This somewhat common insect has been reared from elm from the following localities: Wharton, Allamuchy, and Radburn, N. J.; Hunlock Creek, Pa.; Norfolk, Va.; Wiley Ford, W. Va.; Louisville, Garrison, and Trinity, Ky.; and Athens, Jasper, and Cincinnati, Ohio. In New Jersey adult emergence occurs in the summer months, particularly in August. The adults seem to prefer recently cut or dying branches from one-half to 2 inches in diameter for breeding purposes. The entrance hole is often made near a knot in the branch, and the brood gallery, which runs transverse to the grain of the wood, scores the xylem deeply.

Lichenophanes bicornis (Web.) ((W.S.F.)). A few specimens emerged from elm collected at Westfield, Mass. (July), Athens, Ohio (May), and Indianapolis, Ind. (May).

CISIDAE.

Cis setulosus Mell. ((W.S.F.)). Two adults found in dead elm in July at Readington, N. J.

Cis sp. ((W.S.F.)). Adults have been observed in the bark of dead elm branches removed by sanitation crews in New York and New Jersey.

SCARABAEIDAE.

Trichiotinus affinis (G.&P.). Overwintering larvae of this species have been found in the outer one-half inch of wood of fallen decayed elm branches at Griggstown, N. J., and Radnor, Pa. Adults issued the following spring.

PASSALIDAE.

Popilius disjunctus (Illig.). Live adults observed in April in an elm stump at Staten Island, N. Y.

CERAMBYCIDAE.

Derobrachus sp. ((A.G.B.)). One larva from above source.

Tylonotus bimaculatus Hald. ((W.S.F.)). One specimen emerged in June from elm wood collected previously at Liberty Corner, N. J.

Elaphidion mucronatum (Say) ((W.S.F.)). One adult, Millburn, N. J., issued in June.

Anoplodera pubera (Say) ((W.S.F.)). Adult issuance during April and May from elm branches collected at Chatham and Paterson, N. J.

Strangalia luteicornis (F.) ((A.G.B.)). One larva taken in elm branch at Clinton, Conn.

Neoclytus mucronatus (F.) ((W.S.F.)). Adults of this species issued during August from elm logs cut the preceding May from two devitalized elm trees, about 6 inches diameter breast high, at Athens, Ohio.

Euderces picipes (F.) ((W.S.F.)). One adult, Indianapolis, Ind., issued in May.

Goes pulverulentus (Hald.) ((A.G.B., W.S.F.)). One adult emerged in June from elm wood collected at Liberty Corner, N. J. A number of larvae of this species were noted in March in apparently healthy elm branches ranging from 1 to 4 inches in diameter at West Caldwell, N. J. The larvae excavate large mines deep in the heartwood. Apparently woodpeckers are adept at finding and destroying many of the larvae.

Acanthoderes (*Aegoschema*) *modesta* (Gyll.) ((A.G.B., W.S.F.)). Larvae of this species were removed in April from an old elm branch which had been collected in June of the previous year at Millburn, N. J. A few specimens were reared in August from decayed elm wood obtained at East Stroudsburg, Pa.

Leptostylus aculifer (Say) ((A.G.B.)). Two larvae found in branch of tree affected by the Dutch elm disease fungus at Norfolk, Va.

Leiopus alpha Say ((A.G.B.)). Larvae collected in felled trees cut less than a year at Liberty Corner and Millburn, N. J.

Lepturges querci Fitch ((W.S.F.)). A few adults issued in June from felled trees at Millburn, N. J.

Hyperplatys aspersa Say ((W.S.F.)). This rather common borer issued during the spring and early summer from elm materials collected previously in Massachusetts (Easton), New Jersey (Roseland, Millburn, West Caldwell, and Liberty Corner), and Pennsylvania (Dreher and East Stroudsburg). The life cycle is completed in approximately 1 year in cut elm.

ANTHRIBIDAE.

Eusphyrus walshii Lec. ((L.L.B.)). One adult, Liberty Corner, N. J., issued in May.

CURCULIONIDAE.

Magdalis inconspicua Horn ((L.L.B.)). Occasionally reared from elm collected at Pequannock, Liberty Corner, Griggstown, and Moorestown, N. J., and from Philadelphia, Pa. The life cycle of this species is completed in 1 year, issuance occurring in the summer, particularly in July. Our records show that *inconspicua* is invariably associated with either *M. barbita* Say or *M. armicollis* Say.

Cryptorhynchus fallax Lec. ((L.L.B.)). An old elm log, probably cut in the spring of 1936, found in July 1938 at East Stroudsburg, Pa., produced adults a month later.

Cryptorhynchus sp. ((A.G.B.)). Larvae taken in larger crotches of two elm trees, 3 and 4 inches DBH, in June at Indianapolis, Ind.

SCOLYTIDAE.

Platypus compositus Say ((M.W.B.)). A few adults were removed during September from elm wood found at Huntington, W. Va.

Scolytus rugulosus Ratz. ((M.W.B.)). Frequently collected on elm during the summer in many New Jersey localities; one recorded from Burnside, Ky. One adult was observed feeding in an elm twig crotch in August in New Jersey.

Hylocurus biorbis (Blkm.) ((M.W.B.)). One adult collected in December from a dead branch pruned at Pequest, N. J.

Hylocurus langstoni (Blkm.) ((M.W.B.)). A few adults were removed in September from elm wood found at Charleston, W. Va.

Pterocyclon fasciatum (Say) ((M.W.B.)). One adult issued from elm wood collected at West Caldwell, N. J.

Corthylus columbianus Hopk. ((M.W.B.)). An adult was observed boring in elm wood in June in Ocean Co., N. J.

Stephanoderes dissimilis (Zimm.) ((M.W.B.)). Found boring in recently cut elm tree in July in Millburn, N. J.

Stephanoderes sp. ((M.W.B.)). Adults obtained in March from galleries made in the bark and wood of a dead elm branch collected at Portsmouth, Va. A large series of adults were found in elm bark in September from material collected at Norfolk, Va.

Pityophthorus rhois Sw. ((M.W.B.)). This tiny scolytid was taken abundantly in the dead and dying parts of two elm trees, 3 and 4 inches DBH, at Indianapolis, Ind. Apparently the beetles were just starting their galleries when discovered in June, inasmuch as from three to five adults were found in what appeared to be recently formed nuptial chambers.

Xylosandrus germanus Bldfd. ((M.W.B.)). This introduced oriental species has been reared or found in elm materials collected at Morristown, Troy Hills, Ridgewood, West Caldwell, New Providence, Millburn, and Bloomfield, N. J.; Oyster Bay, Hastings upon Hudson, and near New City, N. Y.; Burlington, Ohio; and Huntington, W. Va. The adults readily attack recently felled elm trees and freshly cut elm logs and stumps, both with and without bark. In addition, they often attack and breed in old cut logs and in dead trees. Based on over 800 specimens collected on felled elm trees at six localities in New Jersey, the peak of emergence for this region occurred in June and July. In an elm stick heavily infested with this species in which the wood was moist and discolored, castings made by the adults and protruding from the bark were nearly one-half inch in length. All stages of this ambrosia beetle were noted in the galleries, some an inch deep in the wood, which extended with and across the grain of the wood. Infested elm examined in November had revealed only females, from 15 to 200 huddled together, overwintering in a gallery in the wood.

Xyleborus affinus Eichh. ((M.W.B.)). Adults have been removed from galleries formed in the bark and wood of cut elm during August (Passaic Co., N. J.) and September (Sugar Grove, Ohio). The galleries, which are several inches long, go with and across the grain of the wood and may be found nearly an inch below the surface of the wood.

Xyleborus fuscatus Eichh. ((M.W.B.)). A few adults reared from elm collected in Morris County, N. J.

Xyleborus saxeseni (Ratz.) ((M.W.B.)). This introduced European species appears to be very common in New Jersey and has been reared from elm collected at many localities. Adults have also been reared from material collected at Norfolk, Va. Sections of infested dead and dying elm trees collected in the fall in New Jersey produced many adults the following May and June.

LEPIDOPTERA.

Tineidae.

Tinea defectella Zeller ((A.B.)). One adult, East Stroudsburg, Pa., issued in July.

Xylesthia pruniramiella Clemens ((A.B.)). Data same as for the next preceding species.

DIPTERA.

TIPULIDAE.

Xiphura sp. ((C.T.G.)). One larva collected in February deep in the wood of a standing dead elm tree at East Stroudsburg, Pa.

CECIDOMYIIDAE.

Holoneurus sp. ((C.T.G.)). Large numbers issued during the spring, summer, and fall from elm wood collected at East Stroudsburg, Pa.

STRATIOMYIDAE.

Zabrachia polita Coq. ((C.T.G.)). Four adults, Stamford, Conn., issued in May.

PHORIDAE.

Megaselia scalaris (Lw.) ((C.T.G.)). One adult, Stamford, Conn., issued in May.

CHLOROPIDAE.

Oscinella ?trigramma (Loew) ((D.G.H.)). Issued in the spring from elm wood collected at East Stroudsburg, Pa.

HYMENOPTERA.

XIPHYDRIIDAE.

Xiphydria tibialis Say ((W.M., D.R., G.A.S.)). This wood-boring species makes its galleries deep in the wood of elm. Infested branches collected in the fall at Millburn and Norwood, N. J., produced adults the following spring and summer.

BRACONIDAE.

Microbracon n. sp. ((C.F.W.M.)). Two adults, East Stroudsburg, Pa., issued in May.

Monogonogastra agrili (Ashm.) ((C.F.W.M.)). Adult issuance in the spring from elm wood collected at Moorestown, N. J., Radnor and Philadelphia, Pa., and Indianapolis, Ind.

Doryctes sp. ((C.F.W.M.)). A few examples of this apparently new species issued in May from wood collected at East Stroudsburg, Pa.

Ecphylus sp. ((C.F.W.M.)). Two adults obtained in May from elm wood collected at Indianapolis, Ind. This braconid is undoubtedly a parasite of *Magdalis armicollis* Say, since emergence from this lot of material was limited to the above-mentioned species.

Heterospilus anthaxiae (Ashm.) ((C.F.W.M.)). A few specimens were reared from elm obtained at Philadelphia, Pa.

ICHNEUMONIDAE.

Rhyssella humida (Say) ((R.A.C.)). One adult emerged in April from an elm branch picked up at Norwood, N. J. Since *Xiphydria tibialis* Say also issued from the branch, it is likely that the wood wasp is parasitized by this species.

Xorides humeralis (Say) ((R.A.C.)). One individual, Moorestown, N. J., issued in March.

CHALCIDIDAE.

Phasgonophora sp. ((A.B.Gahan)). This species is occasionally collected on elm in New Jersey. One specimen was reared in July from an elm branch collected at Memphis, Tenn. Associates emerging about the same time were *Chrysobothris femorata* (Oliv.) and *Neoclytus acuminatus* (F.).

Trigonura tarsata (D.T.) ((A.B.Gahan)). Emergence occurred in the spring and summer from elm wood collected at Pequannock, N. J., East Stroudsburg, Pa., and Athens, Ohio.

EURYTOMIDAE.

Eurytoma appendigaster (Swed.) ((A.B.Gahan)). One adult, East Stroudsburg, Pa., issued in May.

PTEROMALIDAE.

Amblymerus sp. ((A.B.Gahan)). One adult emerged in May from a *Hylurgopinus rufipes* (Eich.) adult found in its hibernating gallery in elm the same month at Chatham, N. J.

LITERATURE CITED.

Kaston, B. J. 1938. Check List of Elm Insects. Conn. Agr. Expt. Sta. Bull. 408: 235–242.

Pechuman, L. L. 1937. An Annotated List of Insects Found in the Bark and Wood of *Ulmus americana* L. in New York State. Bull. Brooklyn Ent. Soc. 32 (1) : 8–21.

A New Record from New Mexico (Pentatomidae-Heteroptera).—Mr. Owen Bryant secured 6 specimens of *Brochymera dilata* Ruckes at Hot Springs, N. M. (elevation 4200 feet), on February 6, 1940.—J. R. DE LA TORRE-BUENO, TUCSON, ARIZ.

BOOK NOTES.

Terceiro Catalogo dos Insectos que Vivem nas Plantas do Brasil, pelo Dr. Angel M. da Costa-Lima; pp. 1–460—i–iv. Directoria de Estadistica de Producçao, Secçao de Publicidade, Rio Janeiro, Brazil.)

This important catalogue lists 1749 species in five Orders, which are injurious to plants in Brazil. These are the Thysanoptera, Hemiptera (Heteroptera and Homoptera), Lepidoptera, Hymenoptera and Coleoptera. The work is a compendium of bionomics of Brazilian insects in these Orders. Its usefulness is greatly enchanced by a bibliography of 1391 titles on Brazilian Insects. The two Indices—an insect index of 40 pages and a plant index of 38—are not only indices to the scientific names but to the common or local names of both. In this aspect, the two indices really become a dictionary.

All in all, this work shows the importance and progress of economic entomology in Brazil. Dr. da Costa-Lima has our warmest thanks and appreciation for this noteworthy work. J. R. T.-B.

A Laboratory Guide in Entomology for Introductory Courses, by Robert Matheson; pp. i–vii—1–135, plates 1–48. 1939. (Comstock Publishing Co., Ithaca, N. Y. $2.00.)

Dr. Matheson is to be congratulated on this extremely clear and very useful work. Of course, experienced entomologists do not need it, but it will be a perfect boon for students.

Instead of the conventional chapters, the work is divided into twenty-eight studies, an appendix, and a 2-page glossary. These studies are on the external and internal structures of insects, mouth parts, metamorphosis and growth; identification of insects, with abbreviated keys to Orders and to selected Families in the principal Orders; wing venation, external structures and identification of Diptera; wing venation, structures and identification of Lepidoptera to Families, and the same for Hymenoptera. Adaptations, sound producing organs and social life of insects each have a section; and also the activities of insects as pollinators and as carriers of disease, with a concluding study on the problems on insect control. The appendix contains brief directions for collection, preparation, preservation and rearing of insects. The plates are very clear line drawings, which bring out the desired details very well.

Two minor disadvantages, easily remedied, are evident in the make up. One is that the book, as a book, will not lie flat when opened, which is overcome by perforating the sheets so they may be readily torn out and put in a binder; the other, that the paper of the copy before me seems soft-surfaced. Doubtless these details will be changed in later editions, as well as such other minor ailments that may show up in use.

At the beginning, we remarked that experienced entomologists would not need it. On second—and better—thought, it might be handy on the desk to catch those slight lapses of memory which all of us experience now and then. J. R. T.-B.

Blatchleyana II—A Supplementary List of the Writings of W. S. Blatchley, etc., by the same; pp. 1–46, plates I–III—1939. (The Nature Publishing Company, Indianapolis, Indiana. 50 cents postpaid; with Blatchleyana, 90 cents for the two.)

This characteristic work of our friend Dr. Blatchley brings down to September 1 of last year his labors since 1930, when the first Blatchleyana appeared. We trust we may see other Blatchleyanas in the years to come, showing the good doctor's indomitable will and work.

He gives first a calendar of his varied activities since 1930. This is followed by a Bibliography of 49 extensive works and papers down to this recent book, together with a list of unpublished papers.

Many apt quotations from his own works and others follow. I was particularly attracted by Dr. Blatchley's comment on Arequipa, in Peru, the home of my fathers for 400 years; and on Lima, where I was born, my childhood home. Nostalgia arose in me as I read about these far ancient cities in their splendid settings. His account of James Whitcomb Riley makes a living figure of a cold literary tradition.

And he sets the capstone to the edifice by his credo of life, "Some of My Beliefs."

One fact stands out—Dr. Blatchley has been, and still is, an outstanding figure in American Entomology and in the study of the protean face of Nature.

Ad multos annos, Doctor. J. R. T.-B.

Third Notice to Authors.—Short papers, not to exceed *one* typed page, are wanted.—Editor.

PROCEEDINGS OF THE SOCIETY.

MEETING OF JANUARY 12, 1939.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, January 12, 1939. President William T. Davis called the meeting to order at 8:00 P.M. Eleven other members were present, *viz.,* Dr. Dietrich and Dr. Tulloch, and Messrs. Buchholz, Dietz, Engelhardt, McElvare, Nicolay, Sheridan, Shoemaker, Siepmann, and Stecher; also Dr. A. Glenn Richards, Jr., Messrs. R. E. Blackwelder, John J. Bowe, A. T. Gaul, G. F. McKenna, N. L. Mayreis, Richard F. Watt, Mrs. Blackwelder and Mrs. Dietrich.

The minutes of the previous meeting were read and approved. Mr. Engelhardt presented the annual report of the treasurer, showing income of $3691.00 (including $655.99 balance brought forward from 1937), disbursements of $3029.01, leaving a balance of $661.99. The loss on the publication of the BULLETIN and *Entomologica Americana* was approximately balanced by income from members dues, sale of reprints, etc. The report of the Treasurer was accepted by the Society with thanks.

The Report of the Publication Committee for 1938, which was sent in by Mr. Torre-Bueno, was read by Mr. Engelhardt, and placed on file.

A resolution was unanimously adopted to the effect that the Society extend a vote of thanks to Mr. Jose R. de la Torre-Bueno for his excellent work as editor of the Society's publications, and for the many good services he has rendered to the society in various ways. It was further resolved that the Secretary be instructed to notify Mr. Torre-Bueno of this action.

Mr. Shoemaker, as chairman of the Nominating Committee, reported the following nominations:

Honorary President, Charles W. Leng.
President, William T. Davis.
Vice President, R. R. McElvare.
Recording Secretary, Carl G. Siepmann.
Corresponding Secretary, Dr. Geo. S. Tulloch.
Treasurer, Geo. P. Engelhardt.
Librarian, Dr. Henry Dietrich.
Curator, J. M. Sheridan.
Delegate to Council of N. Y. Academy of Sciences, Geo. P. Engelhardt.
Editor, J. R. de la Torre-Bueno.

There were no other nominations, and the officers proposed by the committee were unanimously elected.

Mr. William T. Davis showed a series of the cicada, *Diceroprocta apache,* collected by Mr. Engelhardt in California. The specific name of this species refers to its brown and reddish colors.

Mr. Engelhardt was the speaker of the evening, continuing his talk on Alaska, and showing specimens collected on his trip. His notes will be published elsewhere in the BULLETIN.

Mr. Dietz exhibited a specimen of a Thecla, *Strymon m~~p~~aesites,* (H.-S.) from Florida. The species was described from Cuba, and this is a new record for the United States.

The meeting adjourned at 9:30 P.M.

CARL GEO. SIEPMANN,
Secretary.

MEETING OF FEBRUARY 16, 1939.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday evening, February 16, 1939. President William T. Davis called the meeting to order at 7:05 P.M. Ten other members were present, *viz.,* Dr. Dietrich and Dr. Tulloch, and Messrs. Buchholz, Dietz, Engelhardt, McElvare, Sheridan, Shoemaker, Siepmann and Stecher; also Messrs. Victor Baden, J. L. Bassen, John J. Bowe, Donald L. Collins, Abraham Dubitsky, John Elfstrom, Morton Goldstein, Isadore Halpern, Richard F. Watt, Miss Goldman and Miss Kingin.

The minutes of the previous meeting were read by the Secretary, and a brief report was presented by the Treasurer. The Secretary read a communication from Mr. Torre-Bueno, acknowledging the vote of thanks adopted at the previous meeting.

Mr. Engelhardt proposed for membership Mr. Albro Tilton Gaul, 401 Washington Avenue, Brooklyn, New York.

It was moved that the by-laws be suspended, and action be taken on the proposal at the present meeting. This motion was accepted by the Society, and Mr. Gaul was duly elected a member.

Mr. Engelhardt reported the death of Mr. B. Preston Clarke, a specialist in the Sphingidae. Mr. Clarke's collection in this group was very complete, and arrangements had been made by him before his death for the collection to go to the Carnegie Museum at Pittsburgh.

Mr. Davis reported the death of Dr. Wilton Everett Britton, recorded in today's newspapers. Dr. Britton was State Entomologist of Connecticut for the past thirty years, and did excellent work in the preparation of manuals and state lists of the insects of his state.

Mr. Davis exhibited specimens of local katydids, and noted with sorrow the gradual passing of katydids and kindred Orthoptera from Staten Island, with the exception of the angle-winged katydid, *Microcentrum rhombifolium.*

Mr. Engelhardt exhibited specimens of a curious hymenopterous insect, *Kapala floridensis* Ashmead. It is of small size, but has plumose antennae and curious thoracic extensions extending to the tip of the abdomen. Little is known about this insect, but it is believed to be a parasite in ant colonies. Mr. Engelhardt obtained his specimens at St. Augustine, Florida, September 31, 1938.

Dr. Tulloch presented the paper for the evening, speaking on Ticks and the Spotted Fever transmitted by them.

Rocky Mountain Spotted Fever or Eastern Spotted Fever has been reported from all but eight states of the United States. Five cases have been recorded on Long Island during the past summer, with one fatality. Many physicians are not familiar with the disease, and cases are often reported as typhoid fever, infantile paralysis, measles, scarlet fever, smallpox, syphilis, etc.

Spotted fever is characterized by fever, the appearance of a rash, and nervous symptoms. It can be definitely diagnosed by laboratory tests. In the normal course of the disease the patient feels weak, complains of headaches, and in from four to six days a rash appears. If recovery takes place, the patient begins to get better on about the fourteenth day. Small children generally recover, withstanding a fever of 104 to 105 degrees for several days.

The connection between ticks and spotted fever was determined in 1905 by Drs. McCalla and Brereton at Boise, Idaho. Small organisms, known as rickettsial bodies are present in the tick, and when an adult tick becomes engorged with human blood, the rickettsial bodies become activated and enter the host, and Spotted Fever ensues. Both sexes of the tick are involved in the transmission of this disease; this is unlike Texas Fever, where only the female ticks transmit the disease.

Three closely allied species of tick are the vectors of Spotted Fever. *Dermacentor andersoni* is the species in the Rocky Mountain region; *Dermacentor variabilis* is the species of the Eastern States, and the third species, *Haemaphysalis leporis-palustris,* occurs throughout all of the United States. The life histories of the three species are similar. The eggs are laid on the ground. Small six-legged seed or larval ticks emerge, which crawl upon a blade of grass and await a passing mammal to which they attach themselves. When the tick becomes engorged with the blood of its host, it drops to the ground and molts. An eight-legged nymphal stage follows, which again climbs a blade of grass, awaits a mammalian host, engorges, falls to the ground, and molts. An adult flat tick now results. This stage also climbs the vegetation and lies in wait for a host. This time, however, a larger animal, such as a man, horse, sheep or goat is usually selected, whereas in the previous stages a small animal such as a gopher or ground squirrel was selected. After the adult tick has become engorged, it drops to the ground, and the life cycle is completed. Each tick thus has three hosts, two of which are generally small mammals, and the third usually a large mammal, before it lays its eggs.

The occurrence and virulence of Spotted Fever varies much in different places. It is much more important in parts of the Rocky Mountain Region than in the Eastern States. It is particularly important in the Bitter Root Valley, Montana. Strangely enough, there are many cases of the Fever on the West Fork of the river, while there are practically none on the East Fork. In Blodgett Canyon, for example, the ticks have a very virulent strain of the disease, and uninoculated persons going there are almost certain to develop the fever. Yet a mile away there is a very similar canyon, but the ticks do not transmit the fever. The reason for the localization of the fever has not been demonstrated.

Rocky Mountain Spotted Fever attracted great attention when the brother and sister-in-law of the governor of Montana contracted the disease and died. Prominent among the early investigators were R. R. Spencer, who was sent out by the government to study the problem, and R. R. Parker, stationed there on grasshopper work, and later permitted to work with Spencer. The beginning of the cooperation between Spencer and Parker constitutes an important landmark in the study of this disease. Many important contributions have been made by these men and their associates in the U. S. Public Health Service. Most important, however, has been the development of a prophylactic vaccine, a phenolized virus prepared from the tissues of infected ticks. The first attempts toward preparation of the vaccine were made in 1922 and by 1924 a product was produced that was effective in preventing the disease in laboratory animals. Its harmlessness to man was demonstrated in 1925 after Dr. Spencer had subjected himself to the first treatment. At the present time enough vaccine for 100,000 persons is prepared at the laboratory in Hamilton, Montana.

The meeting adjourned at 9:20 P.M.

CARL GEO. SIEPMANN,
Secretary.

Meeting of March 16, 1939.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday evening, March 16, 1939.

President William T. Davis called the meeting to order at 8:15 P.M. Ten other members were present, *viz.*, Dr. Dietrich, Dr. Ruckes, and Messrs. Buchholz, Dietz, Engelhardt, Gaul, McElvare, Shoemaker, Siepmann, and Stecher, also Dr. A. Glenn Richards, Jr., and Messrs. John J. Bowe, Ira M. Friedland, Gerard Haigh, and Edwin Way Teale.

The minutes of the previous meeting were read and approved. Mr. Engelhardt reported as Treasurer, and for the Publication Committee, stating that manuscript was on hand for *Entomologica Americana* for the balance of the year and for the BULLETIN up to October. He called attention to the carefully prepared revision of the *Phoberia—Melipotis—Drasteria* groups of the Noctuidae by Dr. A. Glenn Richards, Jr., which appears in the current number of *Entomologica Americana.*

Dr. Richards said that this paper was the last of six papers by him on this group, and that he had concerned himself with the identification of the known North American species and varieties, and biological notes where known, but did not deal with generic diagnoses. His current paper, together with those that preceded it, complete the drawings of the genitalia of the species of this group.

The speaker for the evening was Dr. Ruckes, who briefly reviewed the genus *Brochymena* of the family Pentatomidae or stink bugs. He supplemented his talk with lantern slides, pointing out structural characteristics that separated the various species and exhibited a collection of twenty of the twenty-one species known from the United States and Mexico. Dr. Ruckes made photographs, where possible, of type specimens and was fortunate enough to have the Stål types sent over from Sweden during the late summer. To these photographs were added those of types of his own and some of Van Duzee's paratypes.

The genus has not been thoroughly worked over recently. The last extensive keys were published by Van Duzee in 1906, at which time only eleven species were known. Many have been described since.

Most of the twenty-one species occur in the southwest, far west, and in Mexico. The eastern species are fewer in number. There are three common eastern species (*B. arborea, B. quadripustulata,* and *B. carolinensis*) and one or two other forms more or less localized in distribution. Our commonest eastern form *B. quadripustulata* is widely distributed in the west and Mexico as well. One of the more interesting eastern forms is *B. myops,* which occurs locally in North Carolina. Specimens collected by Brimley in the vicinity of Raleigh have found their way into many North American collections. *B. punctata* is a most uncommon species, relatively few being found in collections.

Of the many western species, the most interesting is *B. tenebrosa,* which lives on the open desert and is found abundantly on mesquite.

The genus is easily studied in the field; great numbers of specimens at times collect on the trunks of pines and other evergreens. These plants by no means constitute their only foods. As far as known the bugs hibernate as adults and the rough bark of the conifers provides excellent hiding places. Many species found on pine are only resting or hibernating there.

Ordinarily these bugs are phytophagous but a nymph of *B. quadripustulata* has been seen with a caterpillar impaled on its beak.

B. quadripustulata is found feeding on a great number of plants; in the Great Smokies Dr. Ruckes observed them feeding on sumac, the younger individuals on the tips of the branches and the older ones in the larger crotches. *B. sulcata,* a western species, is found on mulberry, apple and other fruit trees; in New Mexico it occurs by the thousands, amounting almost to a pest.

These bugs do not have more than two generations a year and some of them only one. The nymphs of most are poorly known, but as in all pentatomids are more brightly colored than the adults. The odor produced by them is less like the typical bedbug odor and more nearly resembles that of well-ripened apples.

The genus can be divided into two large groups. The first consists of seven species and may be distinguished by having the shoulders squarish and provided with coarse spines; by the metasternal orifice appearing as an inconspicuous pit without an evaporating area; by the claspers of the male genitalia having a prominent ventrally projecting hook overhanging the ventral edge of the cup; by having the basal valves of the female plates convex, swollen or tumid. The second group is distinguished by having the shoulders triangular or rounded instead of squarish; by having the metasternal orifice with a crateriform base from which extends a twisted canal and surrounded by a distinct paler evaporating area; by having the male claspers, if bent at all, overhanging the dorsal edge of the cup and by having the basal valves of the female plates flattish and inconspicuous.

Copulation and courtship in the genus was reviewed, as previously described by Dr. Ruckes in the BULLETIN (Vol. 33, no. 2, pp. 89–90).

Mounting of specimens for collections was discussed and it is recommended that specimens show to best advantage if the elytron and hind wing on one side of the body are spread.

The meeting adjourned at 9:50 P.M.

CARL GEO. SIEPMANN,
Secretary.

NOTE ON A FOSSIL SAWFLY FROM CREEDE, COLORADO.

By T. D. A. COCKERELL, Boulder, Colorado.

In Bull. Brooklyn Ent. Soc., Dec. 1933, I described a sawfly from the Miocene rocks of Creede as *Cephaleia caplani.* It was found by Alan Caplan, who subsequently obtained a much better, nearly perfect, specimen in the same locality. Both specimens are in the Museum of the University of Colorado. The new specimen shows the whole of the radial cell, and other characters which lead me to transfer the species to the genus *Pamphilius.* The following description is from the new specimen.

Pamphilius caplami (Cockerell)

> Length 15.5 mm.; antennae long and slender, about 12 mm. long, width of abdomen about 4 mm. Radial cell long, as a *Pamphilius.* Compared with MacGillivray's fig. 39 (Proc. U. S. Nat. Mus., XXIX, 1906, Pl. XXV) it differs thus: first radial much deeper; second radial more produced apically, so that the upper and lower sides beyond level of insertion of outer intercubitus are longer than the transverse (vertical) diameter at that level; interradius distinctly oblique; lower branch of subcosta longer and less oblique; first cubital cell much longer and larger, its basal end more basad of apex of median cell; first discoidal similar in shape but much longer; second discoidal very large and deep, its side on first brachial very long (more like *Neurotoma*); and fork very acute, the lower branch long; M_3 shaped more as in MacGillivray's figure of *Lyda.*

In the original figure the first cubital cell is drawn too long.

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CARL GEO. SIEPMANN GEO. P. ENGELHARDT

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The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

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BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXXV June, 1940 No. 3

OBSERVATIONS ON LEPTOTHORAX DULOTICUS.[1]

By Laurence G. Wesson, Jr., Haverford, Pa.

In a previous paper (Wesson, 1937), a new species of *Leptothorax* was described, and shown to be dulotic or slavemaking. This was evident from the fact that it was found in a mixed colony containing, besides workers and a dealate female of the new species, workers of both *L. curvispinosus* and *L. longispinosus,* and from the fact that *duloticus* workers were observed to remove pupae from a nest of *curvispinosus* and carry them back to the home nest. Subsequently, in 1937, I was able to find 3 fine, additional colonies within 200 feet of the spot where the type colony was taken. Two of these colonies, containing respectively 40 and 47 *duloticus* and 50 and 70 *curvispinosus,* were transferred to an artificial nest where it was possible to observe their behavior and also to compare them with *Harpagoxenus americanus* (Wesson, 1939) which was being studied at the same time. These observations are presented below.

I. Observations on Workers Deprived of Their Slaves.

Twenty workers of *L. duloticus,* together with about 15 medium-sized larvae, were separated from their slaves. Workers and larvae were placed in a bottle which was connected with a darkened chamber by a 2-in. tube through the cork. The bottle was placed in a strong light. At first the *duloticus* clustered in small groups in the bottle. A few of the ants, especially the darker, older ones persisted in running around and up the sides of the bottle. One or 2 carried a larva apiece to a pile. Several workers found the dark chamber and continued making trips between it and the bottle where most of the workers were clustered. They would go to the dark chamber, stay in it for 10 or 15 seconds, then return to the

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[1] Contribution No. 42 from the Department of Biology, Haverford College, Haverford, Pa.

JUN 12 1940

bottle where they would run about among the other workers, and again go to the chamber. Finally, 2½ hours after the ants had been put into the bottle, a worker picked up a larva and carried it from the bottle through the tube into the dark chamber. Three minutes later the same worker picked up a callow in the bottle and carried it by the mandibles into the chamber. This worker then ceased her activity and remained in the chamber. When there was no more activity during the next hour, the rest of the workers were placed in the dark chamber while the larvae were placed in the tube just beyond the entrance to the chamber. Within half an hour the larvae were carried into the chamber. At first, larvae were carried in sporadically and by only 2 workers, but gradually several more joined them and trips became more frequent. The chamber containing the *duloticus* and larvae was then placed in a foraging box where the ants could obtain food and water. The majority of the workers remained at all times quiescent in the nest, but during the day 4 or 5 workers could usually be seen outside the nest simultaneously. The *duloticus* drank water and sugar syrup placed in the foraging area, and fragments of *Formica* pupae presented to them were carried into the chamber where they were eaten. The foraging was done listlessly, however, and with none of the bustle and energy of *L. curvispinosus* workers. At no time was a worker observed to lead another to the syrup or to the water tube. The larvae were frequently licked by the *duloticus* workers, but did not thrive. Within 2½ weeks 8 had dried entirely, while the remainder were so shrunken that it was obvious that they had not been fed by the *duloticus*.

From the above experiment it seems probable that: (1) *L. duloticus* is an obligatory slavemaker, dependent on its host species, *L. curvispinosus* or *L. longispinosus,* for the rearing of its brood. This was shown by the inefficient foraging, and the comparative neglect of the larvae. (2) *Duloticus* remains so primitive that many of its ancestral formicine instincts are still present, though in attenuated form. Such instincts are those of foraging and of deporting other workers and larvae to a new nest (distinct from the deportation that occurs during a slave raid). These instincts are probably not manifest under normal conditions, but may be called into play by the removal of the slaves.

II. Seasonal Cycle.

The 2 *duloticus* colonies referred to above were kept through the winter following their capture, so that it was possible to observe the complete seasonal cycle. I present this in outline form, taking from my notes selected data on a single *duloticus* colony. Since the dates given for the development in the artificial nest do not correspond to those obtaining under natural conditions, the series is "dated" by the parallel development of *curvispinosus* brood at the same time and under similar conditions.

March 1, 1938. Colony contains 28 *duloticus* workers, 1 dealate *duloticus* queen, about 40 slaves and 10 small larvae (about ¼ the size of a worker). Larvae in the *curvispinosus* colony about the same size.

March 15. Growing season begins.

March 20. *Duloticus* colony: larvae unchanged in size; 1 egg. *Curvispinosus* colony: larvae growing; a few eggs.

March 25. *Duloticus* colony: larvae unchanged; 12 eggs. *Curvispinosus* colony: larvae half grown; many eggs.

April 3. *Duloticus* colony: larvae unchanged; 30 eggs. *Curvispinosus* colony: many larvae nearly grown; many eggs.

April 10. *Duloticus* colony: larvae unchanged; about 40 eggs, a few of which are hatched; 4 *duloticus* workers scouting in the box in which the nest chamber is placed. *Curvispinosus* colony: 6 larvae in the semipupal stage.

April 15. *Duloticus* colony: larvae growing slowly; many eggs hatched; 3 workers scouting. *Curvispinosus* colony: a few pupae and many semipupae.

April 22. *Duloticus* colony: larvae nearly as large as the *curvispinosus* slaves; larvae hatched from the eggs growing rapidly (about 35); 6 to 8 workers scouting. *Curvispinosus* colony: many pupae, a few of them coloring.

April 29. *Duloticus* colony: original larvae, quite large; 35 new larvae as large as the workers; 15 workers scouting. *Curvispinosus* colony: many pupae coloring yellow, some emerging.

May 6. *Duloticus* colony: original larvae in semipupal stage; 35 large larvae and many smaller larvae and eggs present; 15 to 20 workers scouting. *Curvispinosus* colony: pupae emerging rapidly; nuptial flights.

May 10. *Duloticus* colony: 18 semipupae; many other larvae of all sizes. *Curvispinosus* colony: first batch of pupae nearly all emerged; nuptial flights over.

May 16. *Duloticus* colony: 2 female, 4 worker pupae; 20 semipupae, 30 large or medium-sized larvae; many workers scouting. *Curvispinosus* colony: entered on the "summer period"; larvae pupating and pupae emerging continually.

May 30. *Duloticus* colony: 2 female, 1 male, about 45 worker pupae, a few semipupae and larvae; 15 to 20 workers scouting.

June 10. *Duloticus* colony: 5 or 6 pupae emerged; scouting activity of the workers declining.

June 21. *Duloticus* colony: most of the pupae emerged; 3 or 4 workers scouting.

June 27. *Duloticus* colony: all but 1 or 2 pupae emerged; the brood consisting of 2 winged females, 1 male, and about 50 workers. On this day and thereafter there is no more scouting activity on the part of the workers. A few larvae and eggs are present which apparently are not growing. This completion of the emergence of the brood and the cessation of scouting activity would take place under natural conditions, so far as I can determine, between August 5th and 10th.

September 4 and 5. *Duloticus* colony: nuptial flights.

The development of the brood and the onset and cessation of scouting activity in *L. duloticus,* it will be noted, is the reverse of what it is in *Harpagoxenus americanus* (Wesson, 1939). The two forms may be contrasted as follows:—*duloticus:* brood develops principally from eggs laid the same spring; *americanus:* brood develops from larvae produced the previous summer; *duloticus:* nuptial flights take place in September; *americanus:* nuptial flights take place immediately after emergence of the winged brood; *duloticus:* workers begin scouting in the spring about the time that the eggs laid at the commencement of the season begin to hatch, and cease on the emergence of the brood in midsummer; *americanus:* workers begin scouting after the emergence of the brood and continue to do so until fall.

III. SLAVE RAIDS.

I have observed but 3 slave raids by *L. duloticus.* Since the 3 were very similar, only 1 is described as follows:—

April 27, 1938. A *duloticus* colony, containing 28 workers, a queen of *duloticus,* and about 40 *curvispinosus* slaves, was placed at one end of a box. At the opposite end (14 in. distant) was placed a *curvispinosus* colony containing 30 workers, a dealate queen, about 80 pupae, and some larvae. Both the *duloticus* and *curvispinosus* were nesting in small, glass-covered wooden chambers designed to imitate the natural nesting sites of the ants. The room in which the box was placed had been cool in the morning, but became much warmer during the afternoon. At 1:30 P.M. (temp. 73° F.) 2 *duloticus* workers emerged from the nest. By 2:15 (temp. 79° F.) 6 *duloticus* were scouting. Meanwhile, most of the remaining workers in the nest tended to cluster just inside the entrance. The scouting workers walked rather slowly and hesitatingly over the floor and sides of the nest, and reminded one strongly of the appearance of a foraging *curvispinosus* worker. At 2:20 a scout met a *curvispinosus* worker near the latter's nest, and started to examine it. Then the *curvispinosus* attacked, and the scout turned and fled. A few minutes later another scout reached the *curvispinosus* nest, wandered over it a few minutes, left it but soon returned. At 2:35 she came upon the entrance. Very cautiously she inserted her antennae, then turned before the *curvispinosus* were aware of her presence, and went directly to the home nest at a fairly rapid pace. In the home nest she briefly combed her antennae, then ran about excitedly among the other workers that immediately began crowding forward in and about the entrance. Two minutes later she emerged and proceeded toward the *curvispinosus* nest followed by 18 *duloticus* and 5 or 6 *curvispinosus* slaves. The army consisted of a loose, rather rapidly moving file, about 5 in. in length, somewhat bunched in front but more straggling behind. The scout, now the leader of the file, moved with a peculiar, stiff-legged gait, with gaster deflected sharply downward, apparently depositing a scent trail. She moved rather slowly when she became a little in advance of the rest of the file, but fairly rapidly when touched on the gaster by following workers. Two or 3 *duloticus* and most of the slaves became lost from the file and returned to the home nest. The leader reached the *curvispinosus* nest in about 20 sec., climbed the front face of the nest and immediately plunged into the entrance, closely followed by 4 workers, and, at a little distance, by 6 or 7 more. Just inside the entrance the first *duloticus* workers encountered fierce resistance from the *curvispinosus*. With these the *duloticus* immediately grappled, biting and stinging viciously. They did not obtain the close, bulldog grip employed by *curvispinosus* workers when fighting one another, but attempted to seize their opponents, pull them within reach of their stings, then release them. Seven or 8 *duloticus* soon pushed into the *curvispinosus* nest, but it took nearly 3 minutes of fierce fighting before they were definitely masters of the situation. Once in control, and no longer strongly resisted by the *curvispinosus,* they ran about in the nest with excited, rather jerky movements, but showed little or none of the erratic, nip-jerk movements of the black slavemaker, *Harpagoxenus americanus.* They continued to bite and sting the *curvispinosus* workers, but did not retain their grips. By this time, the *curvispinosus* had had enough and fled carrying with them what brood they were able to snatch up. The *duloticus* continued to run excitedly about the nest attacking the few *curvispinosus* that remained, but gradually their excitement subsided. After a while, several *duloticus* dragged dead or injured *curvispinosus* out of the nest and dropped them. During the entire raid, 10 *curvispinosus* workers were killed and 4 or 5 so badly injured that they died in a few hours. No *duloticus* workers were killed or incapacitated. At first, the *duloticus* showed little or no interest in the *curvispinosus* brood, and did not pay any attention to it until they had complete possession of the nest. At 3:10 the first worker emerged carrying a pupa, and others followed singly soon afterward. Two *duloticus* workers, returning to the home nest with brood, brought back auxiliary files to the captured nest, the first comprising 6 *duloticus* and 4 *curvispinosus,* the second, 3 and 1. The *duloticus* continued to transport brood until about 4:30 at which time all pupae, larvae and eggs had been removed from the *curvispinosus* nest. The *duloticus* seemed reluctant to leave the nest, however, and 6 of them remained in it over night. During the following day the *curvispinosus* nest was gradually deserted.

The *duloticus* raid may well be compared with that of *Harpagoxenus americanus* (Wesson, 1939) which enslaves the same species as does *L. duloticus.* The raids of both species are very similar in form: a scout discovers a *curvispinosus* colony and returns to the home nest for an army. The army, led by the scout to the *curvispinosus* nest, kills or drives away the adults, bringing back the brood to the home nest at leisure. Both exhibit a reluctance to leave the captured nest after the *curvispinosus* brood has been removed. The raids of the 2 species differ, however, in many details: the *duloticus* scout is much more timid than the *americanus* scout, and consequently the *duloticus* depend more upon the concerted action of an army; an *americanus* scout will occasionally attack a small or poorly-defended *curvispinosus* colony without recourse to the home nest for assistance; the *duloticus* army moves in a loose, rather straggling file; the *americanus* move somewhat more slowly, but in a close, compact file; the *duloticus* army enters the *curvispinosus* nest by sheer force, biting and stinging the workers and driving them from their nest; the tactics of the *americanus,* on the other hand, consist in nipping at the *curvispinosus* and jerking them around, a worrying process which so excites the *curvispinosus* that they soon flee in a panic. This is more effective as it requires fewer workers and less time to rout the *curvispinosus* colony; *duloticus* workers show little interest in the *curvispinosus* brood until they have complete possession of the nest; *americanus* workers, on the other hand, begin to examine the brood almost as soon as they enter the *curvispinosus* nest; the *duloticus* take the entire captured larval brood to the home nest; the *americanus* usually neglect the very small larvae and eggs (but, in this connection, it should be recalled that *duloticus* begins raiding much earlier in the year than *ameri-*

canus and at a time when the *curvispinosus* brood may consist principally or entirely of larvae). I have not determined whether the *duloticus* reject captured male and female pupae as do the *americanus*.

IV. Observations on Migratory Females.

The nuptial flights took place from the 2 colonies in the artificial nest on September 4th and 5th, 1938, at about 3:30 P.M. Both days were clear and warm (about 82° F.), but not sultry or humid. The box in which the nests were placed had remained in the sunlight during the early morning and in strong, diffuse daylight during the late morning and afternoon.

In an attempt to determine the method of colony formation, 4 females were very carefully dealated at 4:30 and placed in a box containing a *curvispinosus* colony (1 dealate female, 7 workers, 15 pupae and 1 or 2 larvae). For 2 hrs. they ran quite actively over the sides and top of the box; then their activity began to subside and they showed a disposition to gather in crannies or in corners. This change was noted even though the nest was kept warm and illuminated under an incandescent light bulb in order to eliminate any influence due to the fading of daylight. By 8:00 P.M. all the females had taken shelter in cracks or in small sections of hollow weed stems provided them. They remained hidden during the night and did not reappear until the middle of the following afternoon, about the time that the nuptial flight had taken place the preceding day. Again they ran rapidly and somewhat erratically around the nest, taking shelter after a few hours, to repeat the performance on the next day. When they were active during the late afternoons, the females ran about over the *curvispinosus* nest, but showed little interest in it. Occasionally a female came upon the entrance and inserted her antennae, but invariably fled precipitately when snapped at by the *curvispinosus* workers. A group of 5 *curvispinosus* pupae in a small chamber was made accessible to 1 of the females. She entered, walked about in the nest chamber, "sniffed" casually at the pupae, and left, after being in the chamber about 20 to 30 seconds. Two pupae were offered to a female after she had taken refuge in a stem for the night. She smelled them rather casually and, after a few minutes, dragged them part way into the entrance, but deserted them when she left the twig on the following afternoon. On succeeding days the females spent more and more time in their hiding places and finally ceased entirely their afternoon sallies about the box. At no time did they show any interest in the *curvispinosus* nest.

Although these observations are inconclusive as to the method of colony formation of the *duloticus* female, they do indicate that shortly after the nuptial flight *duloticus* females make no attempt to establish a colony by driving away the adults and usurping the brood and nest of a *curvispinosus* colony. This is especially important in view of the fact that such a method is strikingly exhibited by females of *Harpagoxenus americanus* (Sturtevant, 1927; Creighton, 1929; Wesson, 1939), and may indicate a significant difference in the origin and development of slavemaking behavior in the two forms. Other possible methods of colony formation by *duloticus* females are:

(a) The solitary female hibernates and attacks a *curvispinosus* nest the following Spring. This is suggested by elimination, lack of evidence and the fact that the nuptial flight takes place late in the season.

(b) The female seeks out a nest-founding *curvispinosus* female and cooperates with her in rearing a brood. This is doubtful, since the activity of the migratory females falls off steadily and sharply on the days following the nuptial flight.

(c) The female establishes a nest and rears a brood independently. I know of no known instance of such behavior on the part of a parasitic ant species.

V. Type Locality.

Over 200 colonies of *Leptothorax curvispinosus* and 10 to 15 of *L. longispinosus* have been examined in several counties of Southern Ohio. Yet only in the type locality have any colonies been found that contain *L. duloticus.* Here, in an area of about 1,000 sq. ft., 4 colonies out of about 20 examined were found to contain *duloticus.* One of these, the type colony, was quite small, containing but 4 workers and a queen of the slavemaker, and was the only one to contain both *curvispinosus* and *longispinosus* slaves. Two others were much larger, containing about 40 workers and a queen of *duloticus,* and numerous *curvispinosus* slaves. The fourth colony was not taken, but was known to be *duloticus* from the presence of scouts about the entrance, and was assumed to be a rather large one from the number of foraging slaves. The small colony mentioned above was nesting in a large oak gall, while the other 3 were nesting in cavities in dead sticks on the ground. No colonies of *Harpagoxenus americanus* were found. The locality was on a steep, dry hillside thickly covered with small oak trees in which were intermingled a few pines and small maples. The ground vegetation consisted of scattered, low bushes, seedling trees and a few herbs. The shallow, sandstone soil was thickly covered with dead leaves or pine needles. Independent *L. curvispinosus* colonies were numerous, but quite small, living for the most part in hollow acorns or twigs. The few *L. longispinosus* colonies, also quite small, were found principally in the bark or lichen at the base of the pine trees. Possibly the presence of numerous, small colonies of the host species is necessary for the survival of *L. duloticus.*

VI. Observation of Duloticus Queen Eating Egg of Slave.

On placing 1 of the *duloticus* colonies under a microscope on April 17, 1938, I observed a *curvispinosus* slave with gaster flexed forward between her legs in the act of laying an egg. When first seen the egg was about half extruded. The *duloticus* queen meanwhile was in front and a little to one side of the worker, and observing the act intently by continually examining the worker and the egg with her antennae. Not once during the several minutes required to extrude the egg did she turn from the worker. The queen snatched the egg from the worker as soon as it was laid, and devoured it on the spot. Holding the egg to her mouth parts with her fore tarsi, she consumed it in about 5 minutes. Since the eggs laid by unfertilized workers normally produce only males, and since no *curvispinosus* males appeared in the colony, it is evident that few or no eggs laid by *curvispinosus* workers survived, possibly because of being eaten by the *duloticus* queen. Whether this behavior by the queen is widespread among ants, or is a peculiarity of this species, I do not know. The observation is described for any interest it may have.

VII. Description of Male.

The following is a description of the male of *L. duloticus* which was not available at the time of the description of the worker and female (Wesson, 1937).

Male (Fig. 1). Length, 2.8–3.0 mm. Mandibles long, with broad blades, the terminal tooth sharply mucronate, penultimate tooth prominent, the basal teeth obsolete. Anterior border of the clypeus sinuate laterally, projecting and feebly emarginate in the middle; clypeal disk oval, slightly broader than long. Frontal carinae circular, partially enclosing the antennal insertions. Antennae 12 jointed, the scape as long as the first 4 funicular joints; first funicular joint pyriform, second to sixth funicular joints small, subequal, seventh funicular joint larger, the 4 terminal joints forming a distinct club which is slightly longer than the remainder of the funiculus. Mesonotum strongly convex anteriorly, rising abruptly from and projecting somewhat over the pronotum. Thoracic sutures very distinct, the Mayrian furrows strongly impressed throughout their length. Forewings with long radial cell which is narrowly open. Hind wings veinless. Epinotum bearing robust spines about as long as broad at the base. Petiole in profile short, 1 1/3 times longer than broad, broadly convex on the anterior slope, steeper and concave on the posterior slope. From above the petiole is broad, the sides subparallel, slightly narrower anteriorly; node slightly compressed laterally, the superior border feebly emarginate. Petiole bearing a stout ventral downward projecting tooth. Postpetiole from above subrectangular, 1 3/5 times broader than long and broader than the petiole in the same proportion, the anterior angles prominent.

Head opaque, coarsely and densely punctate, the punctures intermingled with fine, sparse, irregular rugae. Mandibles longitudinally striate. Clypeus, thorax, petiole, postpetiole and gaster shining; the clypeus with a few longitudinal rugae, especially on the sides; borders of the thoracic sutures and areas bordering wing insertions, irregularly sculptured; petiole and sides of the epinotum crenulate; gaster and the smooth portions of the thorax very finely and sparsely crenulate and with sparse punctures.

Hairs long, erect, slender, sparse on most of the body, shorter and more numerous on the posterior segments of the gaster, short and reclinate on the legs and antennae.

Color, brownish black; antennae, legs and mandibles pale yellow; clypeus and genitalia reddish brown.

From the male of *L. acervorum,* the male of *duloticus* differs in the long, subdentate mandibles, the presence of a distinct antennal club, the presence of a ventral tooth on the petiole, and the presence of prominent epinotal spines. From the male of *L. longispinosus* to which it also bears a striking superficial resemblance, especially in the shape of the antennae, it differs in the produced emarginate clypeus, the coarsely sculptured head, the presence of epinotal spines and a ventral petiolar tooth, and the entirely different petiole and postpetiole. From the male of *Harpagoxenus americanus* (Creighton, 1927), the *duloticus* male differs in the possession of a distinct antennal club; in having mandibles longer and broader but less dentate; in the entirely different shape of the clypeus; in the possession of acute epinotal spines; in the entirely different shape of the petiole and postpetiole, the former armed ventrally; and in minor differences of sculpture and pilosity.

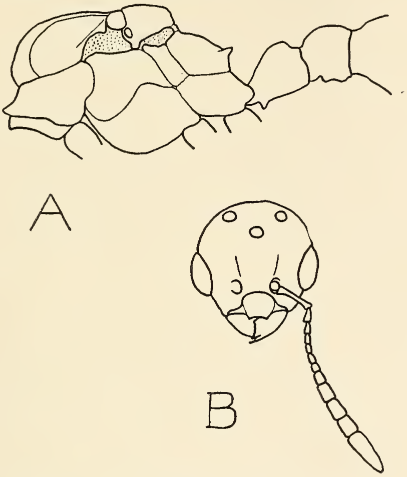

Fig. 1. A, Male of *Leptothorax duloticus* from the side; B, Head of same from the front.

SUMMARY.

1. Various observations on the behavior of *Leptothorax duloticus* are described, and, wherever possible, compared with those of *Harpagoxenus americanus*.

2. The male of *Leptothorax duloticus* is described.

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NEW OR INSUFFICIENTLY-KNOWN CRANE-FLIES FROM THE NEARCTIC REGION (TIPULIDAE, DIPTERA). PART VI.

By Charles P. Alexander, Amherst, Mass.*

The preceding part under this general title was published in April, 1939 (Bull. Brooklyn Ent. Soc., 34: 92–100). Acknowledgements to collectors of the various species are made following the descriptions of the various novelties and rarities. Except where stated to the contrary, all types are preserved in my personal collection of these flies.

Tipula (Yamatotipula) lanei n. sp.

Allied to *spernax;* general coloration black; wings strongly suffused with dusky, the prearcular region and stigma darker brown; R_{1+2} entire or with tip atrophied; abdomen polished black, the extreme posterior borders of intermediate tergites yellow; male hypopygium with the median lobe of tergite very low and broad.

Male.—Length about 11–12 mm.; wing 10–11 mm.; antenna about 2.7–2.8 mm.

Female.—Length about 14 mm.; wing 10–11 mm.

Frontal prolongation of head black, sparsely pruinose; nasus elongate; palpi black. Antennae black throughout, or, in cases, the pedicel a trifle more reddish; flagellar segments not incised, the bases a little thicker than the apices; longest verticils subequal in length to the segments. Head black; vertical tubercle very low.

Thoracic notum black, subopaque, the parascutella paler; dorsal half of pleurotergite abruptly yellow, the color continued onto the extreme cephalic-lateral portions of the mediotergite. Pleura gray; dorso-pleural membrane buffy. Halteres black. Legs with the coxae and trochanters gray pruinose; remainder of legs black, the femoral bases obscure yellow. Wings with a strong dusky suffusion, the prearcular region and the stigma darker brown; a vague dark cloud on anterior cord; restricted obliterative areas across base of cell *1st* M_2; veins brownish black. Venation: R_{1+2} entire or with the outer end atrophied; cell *1st* M_2 and length of vein M_{3+4} variable.

Abdomen polished black, the extreme posterior borders of the third to fifth tergites yellow; hypopygium black. Male hypopygium about as in *spernax;* median lobe of ninth tergite very low and broad, without the square lateral shoulders of the more projecting lobe of *spernax.* Inner dististyle without a conspicuous fringe of long setae on outer margin before base. Gonapophyses appearing as flattened spatulate blades.

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* Contribution from the Entomological Laboratory, Massachusetts State College.

Habitat: Oregon.

Holotype: ♂, Mount Hood, Government Camp, altitude about 4,000 feet, July 6, 1938 (*Lane*). *Allotopotype,* ♀. *Paratopotypes,* 5 ♂ ♀. Holotype in the United States National Museum.

Tipula (*Yamatotipula*) *lanei* is named in honor of the collector, Mr. Merton C. Lane. It is allied to *T.* (*Y.*) *spernax* Osten Sacken, differing in the small size, darkened wings, and the structure of the male hypopygium, as the very low and broad median lobe of the tergite. I place both of these species in the subgenus *Yamatotipula* Matsumura, the assignment being made especially on the structure of the ninth tergite and gonapophyses of the male hypopygium.

Tipula (Vestiplex) churchillensis n. sp.

General coloration gray, the praescutum with four duller gray stripes that are narrowly bordered by pale brown, the mesal edges of the intermediate pair darker on anterior half; no dark setigerous punctures on praescutal interspaces; legs relatively stout; wing pattern very pale, the Anal cells and those beyond cord virtually immaculate; no dark area beyond arculus; *Rs* less than twice the length of *m-cu;* abdominal tergites brownish gray, the lateral borders pale; ovipositor with cerci brownish yellow.

Female.—Length about 18 mm.; wing 14 mm.

Frontal prolongation of head gray above, paler beneath; nasus small and stout; palpi brownish black. Antennae with basal three segments brown, the pedicel a little more brightened, remainder of flagellum black. Head light gray, with a very narrow, median, brown vitta.

Mesonotal praescutum blue-gray, with four duller gray stripes that are narrowly bordered by very pale brown, the mesal edges of the intermediate pair heavier and more distinct, especially on cephalic half; setigerous punctures of interspaces pale and inconspicuous; posterior sclerites of notum gray, the centers of the scutal lobes darker. Halteres with knobs weakly darkened. Legs relatively short and stout; femora yellow, the tips infuscated; tibiae obscure yellow, the tips narrowly darkened. Wings whitish, with a very restricted brown pattern, including small clouds at origin of *Rs*, cord, two in outer end of cell *M* adjoining vein *Cu* and one before midlength of cell *Cu;* stigma paler brown; cells beyond cord and Anal cells virtually unpatterned. Venation: *Rs* relatively short, less than twice the length of *m-cu;* R_{1+2} longitudinal in position so cell Sc_2 at margin is only a little less extensive than cell R_2.

Abdominal segments almost uniform brownish gray, the lateral borders of tergites paling to buffy, the dorsal surface not or scarcely striped; extreme caudal borders of outer segments pale. Ovipositor with cerci pale brownish yellow, relatively broad and flattened, the tips obtusely rounded, the margins serrulate.

Habitat: Manitoba.

Holotype: ♀, Fort Churchill, July, 1934 (*A. M. Heydweiller*); from Ward's Natural Science Establishment, through Mr. Post.

Tipula (*Vestiplex*) *churchillensis* is most nearly related to *T.* (*V.*) *arctica* Curtis, differing especially in the small size and coloration of the thorax and wings. The praescutal punctures are inconspicuous, while the wing pattern is very pale, almost as in the otherwise distinct *T.* (*V.*) *serrulata* Loew.

Tipula (Lunatipula) dupliciformis n. sp.

Allied to *duplex;* size small (wing, male, about 12 mm.); general coloration yellow; wings with cell *1st* M_2 relatively small, pentagonal; male hypopygium with the lateral lobes of tergite broad; outer dististyle nearly cylindrical; gonapophyses appearing as simple spines; major setae of eighth sternite reduced in number.

Male.—Length about 11 mm.; wing 12 mm.

Female.—Length about 16 mm.; wing 13 mm.

Frontal prolongation of head yellow; nasus relatively short; palpi yellow. Antennae yellow, the flagellar segments beyond the second bicolored, the basal enlargements weakly darkened. Head light brown.

Mesonotum chiefly brownish yellow, the praescutal stripes scarcely differentiated; pleura pale yellow. Halteres with stem yellow, knob weakly darkened. Legs with coxae and trochanters pale yellow; remainder of legs obscure yellow to brownish yellow, the outer tarsal segments a little darker. Wings with a strong brown tinge, the cells beyond the cord darker; stigma still darker brown; a conspicuous white obliterative band before cord, extending from before stigma into base of cell M_3; veins brownish yellow. Venation: Cell *1st* M_2 relatively small, pentagonal in outline, shorter than in *duplex*.

Abdomen, including hypopygium, yellow, without distinct markings. Male hypopygium much as in *duplex,* differing as follows: Notch of tergite deeper, the lateral lobes broader, with more evident shoulders. Outer dististyle more slender and more nearly cylindrical. Gonapophyses simple, the tips acute, not bidentate as in *duplex.* Eighth sternite with lateral lobes less conspicuous, with the major setae on either side reduced to one or two in number.

Habitat: Illinois.

Holotype: ♂, University of Illinois Woods, near Urbana; larva in soil, March 7, 1937; emerged in laboratory, April 20, 1937 (*Sarah E. Jones*). *Allotopotype:* ♀, same data; pupated March 7, 1937, emerged April 16, 1937. *Paratopotype:* ♂, pupa in soil, March 7, 1937, emerged April 16, 1937; 1 additional broken specimen, sex uncertain. Types in author's collection, through kindness of collector.

Tipula (*Lunatipula*) *dupliciformis,* while closely allied to *T.* (*L.*) *duplex* Walker (*mingwe* Alexander, *cinctocornis* Doane), is quite distinct in the small size, venation, and especially, in the details of structure of the male hypopygium.

Limnophila (Prionolabis) oregonensis n. sp.

Size small (wing, male, 8 mm. or less); general coloration black; halteres elongate, stem white, knob infuscated; femora and tibiae brown, the tips narrowly more blackened; wings relatively broad, whitish subhyaline, sparsely patterned with brown; cell *1st* M_2 short and broad, cell M_1 subequal to or shorter than its petiole; male hypopygium with the outer dististyle conspicuously pectinate, gonapophyses appearing as slender rods, incurved at distal two-thirds of length.

Male.—Length 5.5–6.5 mm.; wing 7–8 mm.

Rostrum dull black; palpi black. Antennae 16-segmented, black. Head black.

Pronotum dull black, the scutellum more brownish. Mesonotum almost uniformly black, without marked pruinosity; posterior margins of scutal lobes and the parascutella paler. Pleura black. Halteres elongate, stem whitish, knob infuscated. Legs with the coxae brownish black; trochanters brownish yellow; femora and tibiae brown, the tips narrowly more blackened; tarsi black. Wings relatively broad, when compared with *barberi;* whitish subhyaline, sparsely patterned with brown, including the stigma and seams at origin of *Rs,* cord, outer end of cell *1st* M_2 and a broad seam along vein *Cu;* veins light brown, darker in the clouded areas. Venation: R_{2+3+4} a little longer than basal section of R_5; cell *1st* M_2 short and broad; cell M_1 subequal to or shorter than its petiole; *m-cu* at near midlength of cell *1st* M_2.

Abdomen black, the hypopygium a very little brightened. Male hypopygium with the tergal lobes triangular in outline, separated by a U-shaped notch. Outer dististyle conspicuously pectinate, with approximately eight teeth in addition to the terminal spine. Inner dististyle terminating in an obtuse fleshy lobe, before apex on outer face bearing a blackened two-armed structure, the inner arm narrower and more spinous. Gonapophyses appearing as slender rods, strongly incurved at distal two-thirds. Aedeagus compressed on basal portion, the apex long-extended.

Habitat: Oregon.

Holotype: ♂, Boyer, May 24, 1936 (*J. A. Macnab*). *Paratopotypes:* 6 ♂♂, May 16–24, 1936, June 7, 1937.

Limnophila (*Prionolabis*) *oregonensis* is readily distinguished from the other small western Nearctic *Prionolabis L.* (*P.*) *barberi* Alexander, by the elongate halters, broad whitish wings, and, especially, the structure of the male hypopygium, notably the pectinate outer dististyles.

Lipsothrix nigrilinea (Doane).

1900. *Limnophila nigrilinea* Doane; Journ. N. Y. Ent. Soc., 8: 190, plate 8, fig. 2 (venation).

The unique type, a female, was from Olympia, Washington, now preserved in the United States National Museum. A male specimen at hand shows that the species is not a *Limnophila* but a member of the genus *Lipsothrix* Loew, where it is well-distinguished from the approximately one dozen species hitherto made known by the very large size and, especially, by the conspicuous macrotrichia in the cells of the distal fourth of wing. I describe this male as allotype.

Allotype.—Male: Length about 11 mm.; wing 12 mm.; antenna about 4 mm.

Antennae relatively long, as shown by the measurements; flagellar segments cylindrical; verticils short, much shorter than the segments. Head obscure yellow, the occiput darkened. Praescutal stripes entirely confluent to form a black discal shield. *Rs* even longer and straighter than in the type; R_{2+3} a little longer than R_2 alone. Male hypopygium yellow.

Allotype: ♂, Alsea Mount, Oregon, altitude 1,000 feet, June 2, 1929 (*H. A. Scullen*); allotype in collection of Oregon Agricultural Experiment Station.

The relatively long antennae in the male sex are likewise found in two species in Eastern Asia, *Lipsothrix mirabilis* Alexander and *L. pluto* Alexander.

Erioptera (Ilisia) zukeli n. sp.

Female.—Length about 6.5 mm.; wing 6 mm.

Generally similar to *E.* (*I.*) *sparsa* Alexander (California), differing especially in the coloration and pattern of the wings. Wings with the ground-color brownish yellow to pale brown rather than clear yellow, as in *sparsa;* a heavy pattern of darker brown spots and seams; veins beyond cord with conspicuous dusky seams; main stem of vein *Cu* before *m-cu* with a series of four or five brown clouds, contiguous or nearly so; *Rs* with similar clouds, especially near base; Anal cells conspicuously washed with brown, including cell *1st A* and a large brown cloud at near midlength of vein *2nd A;* axillary margin in cell *2nd A* seamed with brown; veins brown, only the interspaces of the costal portion more yellow. Venation: R_{2+3+4} short, subequal to basal section of R_5; *m-cu* about two-thirds its length before the fork of *M;* cell *2nd A* narrower than in *sparsa.*

Habitat: Idaho.

Holotype: Alcoholic ♀, Coeur d'Alene, April 27, 1937 (*Zukel*).

I take great pleasure in naming this fly in honor of my former student, Mr. John W. Zukel, to whom I am indebted for several interesting Tipulidae from Idaho.

Two New Spiders on Staten Island.—Among some spiders collected by myself on Staten Island, two, *Lycosa aspersa Htz.* and *Myrmarachne albocinctus* (*Koch*), are first records for Staten Island. A single female of *L. aspersa* was found at Princess Bay, September 9, while several specimens of *M. albocinctus* were taken at Great Kills, July 9 on flowers. The spiders were determined by Mr. W. J. Gertsch of the American Museum of Natural History.—Borys Malkin, New York, N. Y.

A LIST OF THE GENERA AND SUBGENERA OF THE ALEYRODIDAE.

By E. A. Drews and W. W. Sampson, University of California, Berkeley, Calif.

Due to the gradually increasing economic importance of the family Aleyrodidae numerous workers are today being attracted to the study of this family. Owing to the difficulty in ferreting out the widely separated publications in which the new genera have been described it has been deemed advisable to gather together the genera and subgenera into a list. Thanks are due Professor E. O. Essig and Dr. E. G. Linsley for valuable suggestions.

1. Genus Acanthaleyrodes Takahashi.

Takahashi, 1931, Jour. Soc. of Trop. Agric., 3: 20.
Type.—*A. calicarpae* Takahashi.

2. Genus Acanthobemisia Takahashi.

Takahashi, 1935, Kontyu, 19: 25.
Type.—*A. distylii* Takahashi.

3. Genus Africaleurodes Dozier.

Dozier, 1934, Ann. Mag. Nat. Hist., (10) 14: 187.
Type.—*A. coffeacola* Dozier.

4. Genus Aleurocanthus Quaintance & Baker.

Quaint. & Baker, 1914, Tech. Ser. No. 27, Pt. 2, Bur. Ent., U.S.D.A., p. 102.
Type.—*Aleyrodes spiniferus* Quaintance.

5. Genus Aleurocerus Bondar.

Bondar, 1923, Ind. & Obras Publ. da Bahia, Sec. Patol. Veg., p. 156.
Type.—*A. luxuriosus* Bondar.

6. Genus Aleurochiton Tullgren.

Tullgren, 1907, Ark. f. Zool., 3(26): 14.
Type.—*Chermes aceris ovatus* Geoffroy.

7. Genus Aleuroclava Singh.

Singh, 1931, Dept. Agric. India, Ent. Ser., 12: 90.
Type.—*A. complex* Singh.

8. Genus ALEUROGLANDULUS Bondar.

Bondar, 1923, Ind. & Obras Publ. da Bahia, Sec. Patol. Veg., p. 121.

Type.—*A. subtilis* Bondar.

9. Genus ALEUROCYBOTUS Quaintance & Baker.

Quaint. & Baker, 1914, Tech. Ser. No. 27, Pt. 2, Bur. Ent., U.S.D.A., p. 101.

Type.—*Aleurodes graminicolus* Quaintance.

10. Genus ALEURODICUS Douglas.

Douglas, 1892, Ent. Mo. Mag., (2) 3: 32.

Type.—*A. anonae* Morgan.

Subgenus ALEURODICUS Quaintance & Baker.

Quaint. & Baker, 1913, Tech. Ser. No. 27, Pt. 1, Bur. Ent., U.S.D.A., p. 42.

Type.—*A.* (*Aleurodicus*) *anonae* Morgan.

Subgenus LECANOIDES Quaintance & Baker.

Quaint. & Baker, 1913, Tech. Ser. No. 27, Pt. 1, Bur. Ent., U.S.D.A., p. 70.

Type.—*A.* (*Lecanoides*) *giganteus* Quaintance & Baker.

11. Genus ALEUROLOBUS Quaintance & Baker.

Quaint. & Baker, 1914, Tech. Ser. No. 27, Pt. 2, Bur. Ent., U.S.D.A., p. 108.

Type.—*Aleurodes marlatti* Quaintance.

12. Genus ALEUROMARGINATUS Corbett.

Corbett, 1935, Ann. Mag. Nat. Hist., (10) 16(92): 246.

Type.—*A. tephrosiae* Corbett.

13. Genus ALEUROMIGDA (Author unknown).

Singh, 1931, Memoirs Dept. of Agri. India, Ent. Series, 12: 8.

Singh, in his chart of the genera of the subfamily Aleyrodinae, cites *Aleuromigda.* No further mention is made of it as regards author or type; nor is there any record of it in the literature at our disposal.

14. Genus ALEURONUDUS Hempel.

Hempel, 1922, Not. Prelim. Rev. Mus. Paulista, 2: 5. (Not seen.)

Bondar, 1923, Ind. & Obras Publ. da Bahia, Sec. Patol. Veg., p. 85. (*Pentaleurodicus.*)

Costa Lima, 1928, Suppl. Mem. Inst. Oswaldo Cruz, 4: 137. (Synonymy.)

Type.—*A. induratus* Hempel.

The studies of da Costa Lima have shown that there was no reason for the erection of *Pentaleurodicus* Bondar, since the type of *Aleuronudus* is the same as that of *Pentaleurodicus;* the former was erected first and is valid, the latter, *Pentaleurodicus* becomes a synonym of *Aleuronudus.*

15. Genus ALEUROPARADOXUS Quaintance & Baker.

Quaint. & Baker, 1914, Tech. Ser. No. 27, Pt. 2, Bur. Ent., U.S.D.A., p. 104.

Type.—*Aleyrodes iridescens* Bemis.

16. Genus ALEUROPLATUS Quaintance & Baker.

Quaint. & Baker, 1914, Tech. Ser. No. 27, Pt. 2, Bur. Ent., U.S.D.A., p. 98.

Type.—*Aleurodes quercus-aquaticae* Quaintance.

Subgenus ORCHAMUS Quaintance & Baker.

Quaint. & Baker, 1917, Proc. U. S. Nat. Mus., 51: 400.

Type.—*Aleuroplatus* (*Orchamus*) *mammaeferus* Quaintance & Baker.

Subgenus ALEUROPLATUS Quaintance & Baker.

Quaint. & Baker, 1917, Proc. U. S. Nat. Mus., 51: 382.

Type.—*Aleuroplatus* (*Aleuroplatus*) *quercus-aquaticae* (Quaintance).

17. Genus ALEUROPOROSUS Corbett.

Corbett, 1935, Jour. Mus. Fed. Malay States, 17(4): 844.

Type.—*A. lumpurensis* Corbett.

18. Genus ALEUROPUTEUS Corbett.

Corbett, 1935, Jour. Mus. Fed. Malay States, 17(4): 846.

Type.—*A. perseae* Corbett.

19. Genus ALEUROTHRIXUS Quaintance & Baker.

Quaint. & Baker, 1914, Tech. Ser. No. 27, Pt. 2, Bur. Ent., U.S.D.A., p. 103.

Type.—*Aleyrodes howardi* Quaintance.

Subgenus ALEUROTHRIXUS Quaintance & Baker.

Quaint. & Baker, 1917, Proc. U. S. Nat. Mus., 51: 402.

Type.—*Aleurothrixus* (*Aleurothrixus*) *howardi* (Quaintance).

Subgenus PHILODAMUS Quaintance & Baker.

Quaint. & Baker, 1917, Proc. U. S. Nat. Mus., 51: 404.
Type.—*Aleurothrixus* (*Philodamus*) *interrogationis* (Bemis).

20. Genus ALEUROTRACHELUS Quaintance & Baker.

Quaint. & Baker, 1914, Tech. Ser. No. 27, Pt. 2, Bur. Ent., U.S.D.A., p. 103.
Type.—*Aleurodes tracheifer* Quaintance.

21. Genus ALEUROTITHIUS Quaintance & Baker.

Quaint. & Baker, 1914, Tech. Ser. No. 27, Pt. 2, Bur. Ent., U.S.D.A., p. 106.
Type.—*A. timberlakei* Quaintance & Baker.

22. Genus ALEUROTUBERCULATUS Takahashi.

Takahashi, 1932, Report, Dept. of Agri., Formosa, 59: 20.
Type.—*A. gordoniae* Takahashi.

23. Genus ALEUROTULUS Quaintance & Baker.

Quaint. & Baker, 1914, Tech. Ser. No. 27, Pt. 2, Bur. Ent., U.S.D.A., p. 101.
Type.—*Aleurodes nephrolepidis* Quaintance.

24. Genus ALEYRODES Latreille.

Latreille, 1795, Magasin Encycl., 2: 304.
Latreille, 1804, Hist. Nat. Crustacés et Insèctes, 12: 347.
Latreille, 1807, Genera, 3: 174.
Latreille, 1810, Considerations Génerales sur les insèctes, pp. 265, 434.
Type.—*Phalaena tinea proletella* L.

25. Genus ASIALEYRODES Corbett.

Corbett, 1935, Jour. Mus. Fed. Malay States, 17(4): 841.
Type.—*A. lumpurensis* Corbett.

26. Genus ASTEROCHITON (Maskell) Quaintance & Baker.

Maskell, 1878, Trans. New Zealand Inst., 11: 214.
Quaint. & Baker, 1914, Tech. Ser. No. 27, Pt. 2, Bur. Ent., U.S.D.A., p. 98. (*Dialeurodoides.*)
Quaint. & Baker, 1915, Contents and Index, Tech. Ser. No. 27, Bur. Ent., U.S.D.A., p. XI. (Synonymy.)
Type.—*A. aureus* Maskell.

In their "Contents and Index" of their "Classification of the

Aleyrodidae," Quaintance & Baker explain the change of names. None the less, some of the recent workers still use the name *Dialeurodoides* Quaintance and Baker.

27. Genus BAKERIUS Bondar.

Bondar, 1923, Ind. & Obras Publ. da Bahia, Sec. Patol. Veg., p. 35.

Type.—*B. phrygilanthi* Bondar.

28. Genus BEMISIA Quaintance & Baker.

Quaint. & Baker, 1914, Tech. Ser. No. 27, Pt. 2, Bur. Ent., U.S.D.A., p. 99.

Type.—*Aleurodes inconspicua* Quaintance.

29. Genus BULGARIALEURODES Corbett.

Corbett, 1936, Proc. Roy. Ent. Soc. of London (B), 5: 18.

Type.—*B. rosae* Corbett.

30. Genus CERALEURODICUS Hempel.

Hempel, 1922, Not. Prelim. Rev. Mus. Paulista, 2: 6. (Not seen.)

Bondar, 1923, Ind. & Obras Publ. da Bahia, Sec. Patol. Veg., p. 13. (*Radialeurodicus.*)

Costa Lima, 1928, Suppl. Mem. Inst. Oswaldo Cruz, 4: 137. (Synonymy.)

Type.—*C. splendidus* Hempel.

In 1923, in "The Aleyrodidae of Brazil," Bondar assigned to his newly erected genus *Radialeurodicus* the new species *cinereus.* This species he said was the same as that of Hempel in the latter's new genus *Ceraleurodicus,* except that the adult was of another species. Upon this and several other grounds he said that this genus and some others did not represent what they purported to. For this reason he erected his new genus and species. But as da Costa Lima has pointed out that this cannot hold, and *Radialeurodicus* becomes a synonym of *Ceraleurodicus.*

31. Genus COBRETTIA Dozier.

Dozier, 1934, Ann. Mag. Nat. Hist., (10) 14(80): 190.

Type.—*C. millettiacola* Dozier.

32. Genus DIALEURODES (Cockerell) Quaintance & Baker.

Cockerell, 1902, Proc. Acad. Nat. Sci. Philadelphia, 54: 283.

Quaint. & Baker, 1914, Tech. Ser. No. 27, Pt. 2, Bur. Ent., U.S.D.A., p. 97.

Type.—*Aleyrodes citri* Riley & Howard (= *A. citri* Ashmead).

Subgenus DIALEURODES Cockerell.

Cockerell, 1902, Proc. Acad. Nat. Sci. Philadelphia, 54: 283.

Type.—*Aleyrodes citri* Riley & Howard.

Subgenus DIALEUROLONGA Dozier.

Dozier, 1928, Jour. Agri. Res., 36: 1001.

Type.—*Dialeurodes* (*Dialeurolonga*) *elongata* Dozier.

Subgenus DIALEURONOMADA Quaintance & Baker.

Quaint. & Baker, 1917, Proc. U. S. Nat. Mus., 51: 424.

Type.—*Dialeurodes* (*Dialeuronomada*) *dissimilis* Quaintance and Baker.

Subgenus DIALEUROPLATA Quaintance & Baker.

Quaint. & Baker, 1917, Proc. U. S. Nat. Mus., 51: 435.

Type.—*Dialeurodes* (*Dialeuroplata*) *townsendi* Quaintance & Baker.

Subgenus GIGALEURODES Quaintance & Baker.

Quaint. & Baker, 1917, Proc. U. S. Nat. Mus., 51: 426.

Type.—*Dialeurodes* (*Gigaleurodes*) *maxima* Quaintance & Baker.

Subgenus RABDOSTIGMA Quaintance & Baker.

Quaint. & Baker, 1917, Proc. U. S. Nat. Mus., 51: 425.

Type.—*Dialeurodes* (*Rabdostigma*) *radiilinealis* Quaintance & Baker.

Subgenus RHACHISPHORA Quaintance & Baker.

Quaint. & Baker, 1917, Proc. U. S. Nat. Mus., 51: 430.

Type.—*Dialeurodes* (*Rhachisphora*) *trilobitoides* Quaintance & Baker.

Subgenus RUSOSTIGMA Quaintance & Baker.

Quaint. & Baker, 1917, Proc. U. S. Nat. Mus., 51: 420.

Type.—*Dialeurodes* (*Rusostigma*) *radiirugosa* Quaintance & Baker.

33. Genus DIALEURODICUS (Cockerell) Quaintance & Baker.

Cockerell, 1902, Proc. Acad. Nat. Sci. Philadelphia, 54: 280.

Quaint. & Baker, 1913, Tech. Ser. No. 27, Pt. 1, Bur. Ent., U.S.D.A., p. 26

Type.—*Aleurodicus cockerellii* Quaintance.

34. Genus DIALEURODOIDES Quaintance & Baker.

(See *Asterochiton*.)

35. Genus DIALEUROPORA (Quaintance & Baker) Takahashi.

Quaint. & Baker, 1917, Proc. U. S. Nat. Mus., 51: 434.

Takahashi, 1934, Report, Dept. of Agri., Formosa, 63: 46.
Type.—*Dialeurodes* (*Dialeuropora*) *decempuncta* Quaintance & Baker.

36. Genus EUDIALEURODICUS Quaintance & Baker.

Quaint. & Baker, 1915, Ann. Ent. Soc. America, 8: 369.
Type.—*E. bodkini* Quaintance & Baker.

37. Genus HEXALEURODICUS Bondar.

Bondar, 1923, Ind. & Obras Publ. da Bahia, Sec. Patol. Veg., p. 84.
Type.—*H. jaciae* Bondar.

38. Genus LAINGIELLA Corbett.

Corbett, 1926, Bull. Ent. Research, 16(3): 283.
Type.—*L. bambusae* Corbett.

39. Genus LEONARDIUS Quaintance & Baker.

Quaint. & Baker, 1913, Tech. Ser. No. 27, Pt. 1, Bur. Ent., U.S.D.A., p. 33.
Type.—*Aleurodicus lahillie* Leonardi.

40. Genus LUEDERWALDTIANA Hempel.

Hempel, 1922, Rev. Mus. Paulista, 13: 1151.
Type.—*L. eriosemae* Hempel.

41. Genus MALAYALEYRODES Corbett

Corbett, 1935, Jour. Mus. Fed. Malay States, 17(4): 843.
Type.—*M. lumpurensis* Corbett.

42. Genus METALEURODICUS (Quaintance & Baker) Bondar.

Quaint. & Baker, 1913, Tech. Ser. No. 27, Pt. 1, Bur. Ent., U.S.D.A., p. 73.
Bondar, 1923, Ind. & Obras Publ. da Bahia, Sec. Patol. Veg., p. 81.
Type.—*Aleurodicus minima* Quaintance.

43. Genus MIXALEYRODES Takahashi.

Takahashi, 1936, Kontyu, 10: 150.
Type.—*M. polystichi* Takahashi.

44. Genus NEALEURODICUS Hempel.

Hempel, 1922, Rev. Mus. Paulista, 13: 1134.
Type.—*N. paulistus* Hempel.

45. Genus NEALEYRODES Hempel.

Hempel, 1922, Rev. Mus. Paulista, 13: 1144.
Type.—*N. bonariensis* Hempel.

46. Genus NEOALEURODES Bondar.

Bondar, 1923, Ind. & Obras Publ. da Bahia, Sec. Patol. Veg., p. 128.
Type.—*N. clandestinus* Bondar.

47. Genus NEOMASKELLIA Quaintance & Baker.

Quaint. & Baker, 1913, Tech. Ser. No. 27, Pt. 2, Bur. Ent., U.S.D.A., p. 91.
Type.—*Aleurodes comata* Maskell.

48. Genus OCTALEURODICUS Hempel.

Hempel, 1922, Not. Prelim. Rev. Mus. Paulista, 2: 7. (Not seen.)
Bondar, 1923, Ind. & Obras Publ. da Bahia, Sec. Patol. Veg., p. 27. (*Quaintancius.*)
Costa Lima, 1928, Suppl. Mem. Inst. Oswaldo Cruz, 4: 137. (Synonymy.)
Type.—*O. nitidus* Hempel.

As has been shown by da Costa Lima, *Quaintancius rubrus* Bondar is the same as *Octaleurodicus nitidus* Hempel. Since *nitidus* is the type of its genus, *Quaintancius* is synonymous with *Octaleurodicus.*

49. Genus PARALEYRODES Quaintance.

Quaintance, 1909, Tech. Ser. No. 12, pt. 9, Bur. Ent., U.S.D.A., p. 169.
Type.—*Aleurodes perseae* Quaintance.

50. Genus PEALIUS Quaintance & Baker.

Quaint. & Baker, 1914, Tech. Ser. No. 27, Pt. 2, Bur. Ent., U.S.D.A., p. 99.
Type.—*Aleyrodes maskelii* Bemis.

51. Genus PENTALEURODICUS Bondar.

(See *Aleuronudus* & *Pseudaleurodicus.*)

52. Genus PENTALEYRODES Takahashi.

Takahashi, 1937, Kontyu, 11(4): 310.
Type.—*P. cinnamoni* Takahashi.

53. Genus PSEUDALEUROLOBUS Hempel.

Hempel, 1923, Rev. Mus. Paulista, 13: 1141.
Type.—*P. jaboticabae* Hempel.

54. Genus PSEUDALEURODICUS Hempel.

Hempel, 1922, Not. Prelim. Rev. Mus. Paulista, 2: 9.
Bondar, 1923, Ind. & Obras Publ. da Bahia, Sec. Patol. Veg., p. 85. (*Pentaleurodicus.*)
Costa Lima, 1928, Suppl. Mem. Inst. Oswaldo Cruz, 4: 137. (Synonymy.)
Type.—*P. bahiensis* Hempel.

55. Genus QUAINTANCIUS Bondar.

(See *Octaleurodicus.*)

56. Genus RADIALEURODICUS Bondar.

(See *Ceraleurodicus.*)

57. Genus SETALEYRODES Takahashi.

Takahashi, 1931, Soc. of Trop. Agri., 3: 21.
Type.—*S. mirabilis* Takahashi.

58. Genus STENALEYRODES Takahashi.

Takahashi, 1938, Trans. Nat. Hist. Soc. of Formosa, 28: 269.
Type.—*S. vinsoni* Takahashi.

59. Genus SIPHONALEYRODES Takahashi.

Takahashi, 1932, Report, Dept. of Agri., Formosa, 59: 48.
Type.—*S. formosanus* Takahashi.

60. Genus SIPHONINUS Silvestri.

Silvestri, 1915, Portici Boll. Lab. Zool. 9: 245.
Type.—*S. finitimus* Silvestri.

61. Genus SYNALEURODICUS Solomon.

Solomon, 1935, Jour. Royal Soc. W. Australia, 21: 79.
Type.—*S. hakeae* Solomon.

62. Genus TAIWANALEYRODES Takahashi.

Takahashi, Report, Dept. of Agri., Formosa, 59: 28.
Type.—*T. meliosmae* Takahashi.

63. Genus TETRALEURODES (Cockerell) Quaintance & Baker.

Cockerell, 1902, Proc. Acad. Nat. Sci. Philadelphia, 54: 283.

Quaint. & Baker, 1914, Tech. Ser. No. 27, Pt. 2, Bur. Ent., U.S.D.A., p. 107.

Type.—*Aleyrodes perileuca* Cockerell.

64. Genus TETRALICIA Harrison.

Harrison, 1917a, Vasculum, 3: 60.

Harrison, 1917b, The Entomologist, 50: 651.

Type.—*T. ericae* Harrison.

65. Genus TRIALEURODES (Cockerell) Quaintance & Baker.

Cockerell, 1902, Proc. Acad. Nat. Sci. Philadelphia, 54: 283.

Quaint. & Baker, 1914, Tech. Ser. No. 27, Pt. 2, Bur. Ent., U.S.D.A., p. 104.

Quaint. & Baker, 1915, Contents and Index, Tech. Ser. No. 27, Bur. Ent., U.S.D.A., p. XI. (Synonymy.)

Type.—*Aleyrodes pergandei* Quaintance.

66. Genus TUBERALEYRODES Takahashi.

Takahashi, 1932, Report, Dept. of Agri., Formosa, 59: 29.

Type.—*T. machili* Takahashi.

67. Genus UDAMOSELIS Enderlein.

Enderlein, 1909, Zool. Anz., 34(7/8): 231.

Type.—*U. pigmentaria* Enderlein.

68. Genus XENALEYRODES Takahashi.

Takahashi, 1936, Tenthredo, 1(2): 113. (Not seen.)

Type.—*X. artocarpi* Takahashi.

69. Genus ZAPHANERA Corbett.

Corbett, 1926, Bul. Ent. Research, 16: 282.

Type.—*Z. cyanotis* Corbett.

To Authors.—This BULLETIN CANNOT accept articles longer than six (6) pages typed double space, for publication before 1941. Such shorter papers, if suitable, will be used promptly, in accordance with our policies.—PUBLICATION COMMITTEE, BROOKLYN ENTOMOLOGICAL SOCIETY.

CALOSATURNIA MERIDIONALIS SPECIES NOVA (LEPIDOPTERA, SATURNIIDAE).

By John Warren Johnson, Berkeley, California.

Holotype:

Sex: female.

Wing expanse: 66 millimeters.

Head: clothed with short, fine, brown hairs; eyes unconcealed; antennae red, the abortive second pectinations of the segments present as short spines.

Thorax: dorsum bearing a narrow band of white hairs posterior to the head between the wing bases of the primaries, this band defined posteriorly by dark gray-brown hairs; the remainder of the dorsum clothed thinly by fine fulvous hairs. Venter clothed with silky gray-brown hairs; legs covered distally by bright ruby-red hairs, coxae clothed with hairs of same tint as thorax venter.

Abdomen: dorsum with scattered fulvous hairs anteriorly and closely appressed short, gray-brown hairs and scales. Venter covered by silky light, gray-brown hairs.

Wings: superior surface of primaries—Costal margin gray; outer two-thirds of wing light fulvous, becoming pale brown apically along the outer margin; fringes of outer margin dark gray-brown; a black submarginal band from apical markings to inner angle, defined outwardly by a narrow line of pale brown scales; basal area of wing more orange fulvous, separated from outer wing surface by a line of scattered black scales across the cell; apical markings composed of an irregular black patch indistinctly continuous with the submarginal black band posteriorly, outlined outwardly by pale blue scales, a central patch of white scales, enclosed outwardly by red scales and scattered black scales, the red tint extending to the apical margin and separated posteriorly from the tip of the black band by pale brown scales; ocellus with a small hyaline space in the central black ovate spot, a ring of yellow scales encircling the spot, the yellow encircled by the outer black ring, this bearing a crescent of blue scales on its proximal half, the blue scales bordering the yellow scales; the ocellus separated from the basal fulvous area by pale fulvous scales, these faintly spreading posteriorly defining the margin of the basal area behind the cell.

Superior surface of the secondaries—Outer two-thirds of the wing slightly lighter, brighter in tint than the primaries; a broad black submarginal band from outer to anal angles; base of wing with fuscous scales, peppered with fulvous scales and with long fulvous hairs; fringes of outer margin dark gray-brown, of inner margin of the tint of the adjoining wing area.

Inferior surface of the primaries—Costal margin dark gray; wing bright, light fulvous, becoming pale brown apically along the outer margin; base of wing darker, with scattered fuscous scales, an indistinct line of black scales across the cell; submarginal black band narrower than on superior surface, becoming quite narrow across the median nervules, touching the apical markings; apical markings somewhat less bright than on superior surface; ocellus as on superior surface.

Inferior surface of secondaries—Costal margin with whitish hairs, these defined posteriorly by dark scales; wings dull fulvous; basal third of wing darker, with fulvous and fuscous scales closely mixed, and long pale fulvous hairs; black submarginal band narrower than superior surface, less regular in outline than above, defined outwardly by a thin row of pale brown scales; ocellus similar to that of superior surface.

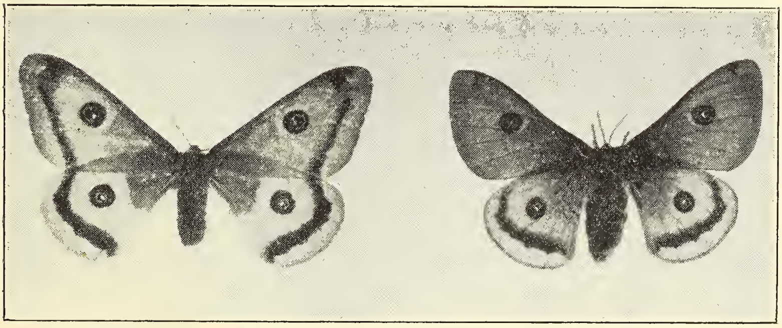


FIG. 1. *Calosaturnia meridionalis* species nova, holotype, female; superior surface.

FIG. 2. *Calosaturnia mendocino* Behrens, female; superior surface.

COMPARISON:

A comparison of *meridionalis* with *Calosaturnia mendocino* and *albofasciata* reveals the distinct differences that exist between the females of these species: primaries of *meridonalis* of almost like tint to secondaries, in contrast to the unlike wings of *mendocino,* and of very different coloration from *albofasciata;* the primaries bearing a strong submarginal black band, differing from the unbanded primaries of *mendocino,* and the white-banded primaries of *albofasciata.* These differences hold likewise for the inferior surfaces. The wing-form differs likewise in *meridionalis* from that of the other two species; costal and outer margins of primaries quite straight, apices strongly angled, contrasting to more rounded wing outlines of the other species; the hindwings proportionately narrower than in the other species. Compare the figures of *Calosaturnia meridionalis, holotype* specimen, and *Calosaturnia mendocino* female in the accompanying plate.

Calosaturnia meridionalis, the "Southern Calosaturnia," is the second new species to be described in recent months. Only the holotype is known. As in the two other species, the female characters are very distinct. It is probable that the males will differ much less from the generic male pattern as typified by male *mendocino,* if one may judge on the basis of the sexual dimorphism of *C. albofasciata,* in which the female differs widely from the male, the male being quite similar in gross pattern to *mendocino* males.

Thanks are expressed to Mr. Erich Walter of Anaheim, California, for kindly loaning the specimen for purposes of description, and to Professor W. A. Setchell and Professor E. C. Van Dyke of Berkeley, California, for their suggestions while this manuscript was being prepared.

Holotype: female, collected March 15, 1925, in Santiago Canyon, Santa Ana Mountains, Orange County, California, by Mr. Erich Walter. Holotype in the collection of Mr. Walter at Anaheim, California.

Thasus gigas Burmeister, a Correction.—In this Bulletin, vol. XXXV, p. 45, the food-plant of *Th. acutangulus* Stål is recorded. Mr. H. G. Barber has written me that this might be a misidentification. On checking specimens with his drawings he very kindly sent me, of the hind tibiae of both sexes of the two species, his suspicion that the species in question was really *Th. gigas* Stål was verified. The identification had been made by comparison with specimens not determined by me.—J. R. DE LA TORRE-BUENO, Tucson, Ariz.

A PRELIMINARY REVIEW OF THE NORTH AMERICAN SPECIES OF DENDROPHILUS (COLEOPTERA, HISTERIDAE).

By Edward S. Ross, Berkeley, Calif.

The holarctic genus *Dendrophilus* Leach consists of a small number of species which are often incorrectly distinguished by external characters. The writer's examination of the male terminalia of the majority of the known species has revealed some useful characters for separating as well as relating our North American species. These characters which correlate with certain external features place these species into two groups; the first consisting of *punctatus* Herbst (=*punctulatus* Say, *sexstriatus* Hatch) and *tularensis* Ross, the second consisting of *californicus* Horn and the new species described herein.

A Key to the North American Species of Dendrophilus.

1. Pygidium very finely and densely punctate, punctures indistinct, shallow. Male: Aedeagus stout, not curved ventrad apically; basal-piece large. (figs. 1 and 2) .... 2.

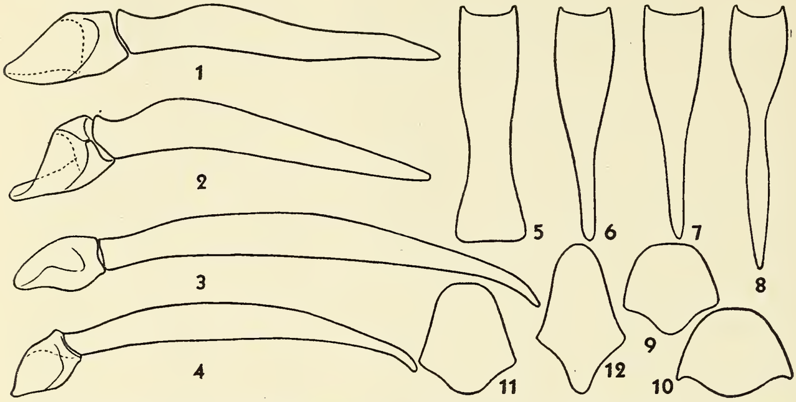
—. Pygidium much more coarsely and sparsely punctate, punctures clearly defined, deep. Male: Aedeagus slender, apex curved ventrad; basal-piece small. (figs. 3 and 4) .... 3.

2. Elongate; surface feebly convex. Fifth and sutural striae of elytra traceable by series of punctures to base. Male: Aedeagus (fig. 2) not sinuate; ninth sternite (fig. 6) narrowed basally. California .... (2) *californicus*

—. Short; surface strongly convex. Fifth and sutural striae of elytra obsolete in basal half. Male: Aedeagus (fig. 1) sinuate; ninth sternite (fig. 5) as broad at base as at apex. South Carolina .... (1) **opacus** n. sp.

3. Surface strongly, evenly punctate throughout. Fifth and sutural striae of elytra distinctly impressed in entire basal half. Male: Tenth tergite (fig. 11) broadly rounded on both apical and basal margins. California (3) *tularensis*

—. Surface less strongly, unevenly punctate; punctures of elytra decreasing in size and density in basal half, particularly in sutural area. Fifth and sutural striae of elytra obsolete or represented only by punctures in basal half. Male: Tenth tergite (fig. 12) narrowly rounded apically; acutely angulate basally .... (4) *punctatus*



Explanation of Figures: 1. Aedeagus of *Dendrophilus opacus* n. sp. (lateral aspect), 2. *D. californicus* Horn, 3. *D. tularensis* Ross, 4. *D. punctatus* Herbst; 5. ninth sternite (male) of *D. opacus,* 6. *D. californicus,* 7. *D. tularensis,* 8. *D. punctatus;* 9. tenth tergite (male) of *D. opacus,* 10. *D. californicus,* 11. *D. tularensis,* 12. *D. punctatus.* All drawings camera lucida 30 ×.

(1) **Dendrophilus opacus** n. sp.

Broadly oval, convex; black, opaque. *Head* finely and evenly punctate. *Pronotum* twice as wide at base as median length; sides rather strongly convergent, evenly but weakly arcuate from base to apex, not abruptly rounded at apical angles; basal margins very feebly arcuate, uniting medially to form a broad, blunt, obtuse angle; ante-scutellar impression very shallow, indistinct; entire surface evenly punctate, punctures small, deep, interspaces two to three times their diameters, these spaces finely but distinctly alutaceous with occasional micropunctures. *Elytra* with outer marginal stria distinct, entire, nearly uniting with the deeply grooved inner marginal stria of epipleura both at the base and the apex; inner and oblique humeral striae both subobsolete; first four discal striae prominent, abbreviated at apical fifth, becoming progressively shorter towards suture; fifth and sutural striae represented in median third only, fifth traceable by a series of punctures to base; punctuation moderate, denser at sides and apex; interspaces finely, distinctly alutaceous. *Pygidium* large, nearly flat; strongly alutaceous; punctures of small size, very numerous, dense, separated by interspaces of less extent than their diameters; apex flat, with much finer punctuation. *Male terminalia: Ninth sternite* (fig. 5) broad throughout, base slightly wider than apex; sides constricted medially. *Tenth tergite* (fig. 9) broad, sides weakly convergent; apex broadly rounded, truncate; basal margins weakly emarginate, meeting to form a blunt ninety-degree angle. *Aedeagus* (fig. 1) stout, short, sinuate (lateral aspect), apices of lateral lobes not curved ventrad; basal-piece very large. *Length* 3.5 mm., *width* 2.75 mm.

Holotype, male (U.S.N.M.) and six paratypes (one male and five females) collected in a nest of the Florida Wood Rat on Seabrook's Island, South Carolina, May 25, 1934, by Mr. O. L. Cartwright who very kindly sent the specimens to me for determination.

Two additional specimens at hand, both females, which appear to represent this species are labeled "N. Ill." (= Northern Illinois ?) and are from the C. W. Leng collection. These are not designated paratypes, however, in the absence of males in the series. If these are indeed *opacus* the known range of the species would be considerably extended.

The paratypes are deposited as follows: two in the collection of Mr. O. L. Cartwright, one in that of Mr. R. L. Wenzel, another in the California Academy of Sciences and the remaining two, a pair, in the writer's collection.

Secondary to the striking genitalic characters (which are inconvenient to use), this species may be readily separated from *punctatus* by its large, nearly flat, more finely and closely punctate pygidium (which is much like that of *pygmaeus* L., a European species) ; otherwise, except for the uniformly larger size of *opacus,* the two are very similar in appearance. *Opacus* is most closely related to *californicus* Horn, by both genitalic and pygidial characters but it can be distinguished from the latter by its more robust form, obsolete fifth and sutural elytral striae and the genitalic characters as illustrated.

(2) *Dendrophilus californicus* Horn

Dendrophilus californicus Horn, 1892, Trans. Amer. Ent. Soc., 19: 46; Ross, 1937, Pan. Pac. Ent., 13: 68; Hatch, 1938, Journ. Kans. Ent. Soc., 11: 19 (key).

At the time of my earlier studies in this genus I had not as yet investigated genitalic characters and as a result partially misidentified a series of western *Dendrophilus* as *californicus* (Pan. Pac. Ent., 13: 68). With one exception, the specimen from Stockton, California, this series really represents another form which I am now assigning to *punctatus* Herbst. This example from Stockton collected by Dr. F. E. Blaisdell April 15, 1932 which seemed to fit

Horn's description of *californicus* well, was sent to Mr. Mark Robinson of Philadelphia to be compared with the type. Mr. Robinson's reply stated that the specimen was "an exact duplicate of the type of *californicus*."

The description of this homotype, a male, is given as follows:

> Elongate-oval, convex; color dark rufous; surface finely, unevenly punctate. *Head* finely, evenly punctate throughout. *Pronotum* less than twice as wide at base as median length; sides very feebly arcuate, abruptly rounded near apical angles; basal margins nearly straight, converging at scutellum to form a broad obtuse angle; ante-scutellar impression prominent broad, shallow; punctuation fine, sparse medially, interspaces three to four times the diameters of punctures, these interspaces faintly alutaceous with occasional micro-punctures, punctuation somewhat coarser and denser laterally. *Elytra* with outer marginal stria sinuate, almost uniting with the deeply grooved, entire inner marginal striae of epipleura both at base and at apex; humeral striae obsolete, represented by but faint median impressions; oblique humerals not prominent; first four discal striae of each elytron extending from base of elytra and terminating at apical sixth, punctate; fifth and sutural striae represented in basal half by prominent but uneven punctures; punctuation baso-medially similar to that of the discal area of the pronotum, laterally and apically the punctures become larger and more dense; punctuation of epipleura coarse, shallow, dense but not confluent; interspaces of punctures very faintly alutaceous with occasional micro-punctures which are particularly noticeable in the sutural area. *Pygidium* large, nearly flat; punctures uniformly small, shallow and dense, separated by alutaceous interspaces slightly less in extent than their diameters; apex rounded, punctures extremely fine, interspaces polished. *Male terminalia: Ninth sternite* (fig. 6) broad at apex, sides evenly convergent, base narrow. *Tenth tergite* (fig. 10) broad; sides gradually convergent, feebly arcuate; apical margin truncate; basal margin broadly arcuate. *Aedeagus* (fig. 2) stout, short; apex of fused parameres not curved ventrad; basal-piece large. Length 3.75 mm., width 2.75 mm.

Type locality: Santa Clara Co., Calif.

Homotype locality: Stockton, Calif., April 15, 1932 (F. E. Blaisdell).

As stated before, *californicus* seems to be definitely related to *opacus* from South Carolina and not at all closely to the other species known from California; *punctatus* Herbst and *tularensis* Ross.

The elytra of this specimen of *californicus* do not appear dull at their apices, a character which has been used to separate it from others species; the pygidial and genitalic characters are much more useful for this purpose.

(3) *Dendrophilus tularensis* Ross.

Dendrophilus tularensis Ross, 1937, Pan. Pac. Ent., 13:67.

This species can be recognized immediately by its uniform, coarse elytral punctuation and by its deeply impressed, basally-entire fifth and sutural striae of the elytra.

An examination of the terminalia of the holotype of this species, a male, indicates a relationship with *punctatus* by the nature of the aedeagus (fig. 3) and ninth sternite (fig. 7) but the tenth tergite (fig. 11) seems to be intermediate in form to that of *californicus* (fig. 10) and *opacus* (fig. 9).

Type locality: Kaweah, Tulare Co., Calif.

(4) *Dendrophilus punctatus* Herbst

=*Dendrophilus punctulatus* Say, fide Hatch, 1938, Journ. Kans. Ent. Soc., 11: 20.
=*Dendrophilus sexstriatus* Hatch, 1938, Journ. Kans. Ent. Soc., 11: 18, fide Wenzel, 1939, in litt.

Series of specimens of the European *punctatus* and the American "*punctulatus*" seem to be inseparable by either external or genitalic characters.

Mr. R. L. Wenzel who has examined the holotype and the paratype of *sexstriatus* Hatch, which are from Iowa, states (in a letter to me) that this species is based upon variants of *punctatus* and should therefore be regarded as a synonym of it.

The typical *punctatus* has the elytra about as equally punctate in the basal half as at the apex and the fifth and sutural striae of the elytra are obsolete. But, occasionally within the eastern range of the species appear individuals (*sexstriatus* of Hatch) which are slightly smaller in size which have their elytral punctuation abruptly finer and sparser in the basal half of the elytra, and their fifth and sutural elytral striae traceable to their bases by rows of punctures. According to Wenzel (in litt.), a gradual intergradation can be seen between these two types in any large series of *punctatus*.

The series previously referred to from the Pacific Coast is, however, uniformly of this latter unequal-punctate six-striate type and no specimens of the typical *punctatus* are present. However, no significant male genitalic differences seem to prevail between it and *punctatus.*

Although there seems to be some need for at least a subspecific ranking for this Pacific Coast series, I have, with some hesitation, finally decided to refer these specimens to *punctatus* for the present, as they are inseparable from the eastern variants of *punctatus.*

North American records:—BRITISH COLUMBIA: 3, Vancouver, March 2, 1927, "in a culture of *Tenebrio* etc. in bran" (H. B. Leech). CALIFORNIA: 12, San Francisco, Aug. 7, 1906, "rotting vegetation"; 1, Tuolumne Co., July 15, 1910; (E. C. Van Dyke). CONNECTICUT: 1, Hartford; 1, Lyme, May 8, 1915, (W. S. Fisher); (U.S.N.M.*). DISTRICT OF COLUMBIA: Washington; 2, (Leng Coll.); 3, (Hubbard and Schwarz Coll.); 1, 1896 "in sweepings from feed store"; (U.S.N.M.). IOWA: 1, Monroe Co., April 21, 1930 (H. Knight); 1, Mt. Pleasant, Feb. 26, 1931 (Hagedun); (Types of *sexstriatus*). KANSAS: 1, Abilene, June 28, 1931, "dead in basement of flour mill"; 1, Salina, Aug. 28, 1934, "dead in basement of flour mill"; 6, Topeka (Popenoe); (U.S.N.M.). LOUISIANA: 1, "La.", March 20, 1938 "nest of Ivory-billed Woodpecker" (A. P. Jacot); (U.S.N.M.). MARYLAND: 1, Kenilworth, May 21, 1906, "in flour mill"; 1, Rockville, July 21, 1931, "in flour mill"; 1, Sandy Springs, June 23, 1931, "in waste grain in mill"; (U.S.N.M.). MASSACHUSETTS: 1, Chatham, June 26, 1919, (E. R. Leach). NEW JERSEY: 1, Wildwood, Oct. 26, 1932; 1, Haddon Hts., April 25, 1932; (L. J. Bottimer). NEW YORK: 1, Dunden, (Hubbard and Schwarz Coll.), (U.S.N.M.); 1, Lewiston; 1, Rockaway Bch., L. I.; 1, Long Isle; 1, Westchester Co.; 2, "N. Y."; (C. W. Leng Coll.). OREGON: 1, McMinnville, May 7, 1937, (K. M. Fender). PENNSYLVANIA: 2, Philadelphia, (Popenoe); (U.S.N.M.).

The fact that this species has been frequently collected in flour mills, etc., as the above records show, indicates that the species may often be a predator of certain granary insects. If this proves to be the case, the fact that *punctatus* occurs both in Europe and America could be explained on the basis of an introduction by man in commerce.

I wish to acknowledge the assistance of Mr. R. L. Wenzel, Mr. O. L. Cartwright, Mr. Mark Robinson, Dr. F. E. Blaisdell and Dr. E. C. Van Dyke in the preparation of this paper.

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* The included U. S. National Museum records were kindly furnished me by Mr. R. L. Wenzel.

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BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXXV October, 1940 No. 4

THE WING MOTION OF THE DRAGONFLY.

By Leigh E. Chadwick, Pueblo, Colo.

In most of the higher orders of insects, there is evident a tendency to concentrate the function of flight within the limits of a single segment. This tendency is guided by simple laws of mechanical efficiency. For a given area of wing surface, the ratio of effective to "dead" area is greatest when the whole is in one piece. Unification of the wing surface avoids the disadvantage of having one pair of wings working in a region of turbulence which has been produced by the other pair, while at the same time the concentration of the principal flight muscles within one segment permits an advantageous redistribution of weight and results in greater stability.

Thus the Hymenoptera, Heteroptera, Homoptera and Lepidoptera have achieved a functional unity of wing surface, while retaining two pairs of morphologically distinct wings, by reducing the metathoracic pair and by developing various devices for holding the two wings of the same side together, or more frequently, by a combination of both types of development. Other insects, notably the Diptera and certain of the Ephemeroptera, have carried the tendency to the point where only the anterior pair of wings is used for propulsion. Among the Coleoptera, although there appears to be great diversity in the degree in which the elytra are concerned in flight, the motion of the anterior pair of wings is usually limited and it is the metathoracic wings whcih are most active. The culmination of such a trend is seen in the Strepsiptera, which resemble the Diptera in having only one pair of wings functional as such, the other pair surviving as sensory organs of uncertain function, the halteres.

In contrast with the insects mentioned above, the flying members of the orthopteroid and lower neuropteroid orders have the two wings of the same side more nearly equal in development, discounting the enlarged vannus in the metathoracic wings of many

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orthopteroid species. The anterior and posterior pairs of wings are functionally separate, and the motor apparatus is correspondingly distributed. It is also noteworthy that the mechanism for indirect depression of the wings, which involves a closely-knit dorsal skeleton and hypertrophy of the thoracic dorsal longitudinal muscles, is not prominently developed in these forms. Though their flight is sufficient for their needs, these insects cannot be said to command the air to the same extent as those do whose flight mechanism is more concentrated.

The Odonata resemble orthopteroid and neuropteroid insects in the possession of equally developed, unconnected fore and hind wings, each pair driven by a separate muscular unit, as in the weak development of the longitudinal dorsal muscles. It is interesting, therefore, that the dragonflies, having achieved none of the advantages of structure of the more modern groups, are nevertheless among the swiftest and most skilful flyers, and regularly overtake and capture on the wing representatives of a theoretically more efficient type.

Part of their success is due, no doubt, to the high development of the eyes and the motor reflexes governed by them, but it is true also that the wing motion of dragonflies differs from that of other insects with two functionally separate pairs of wings in such a way as to compensate partially for the disadvantage of this condition. This becomes apparent when the movement of the wings is analyzed with the aid of high-speed photography.

Plate I shows a plot of the wing motion of a dragonfly (*Ladona exusta* Say, var. *julia* Uhler), obtained by this means. The insect was fastened, and stimulated to fly by removing a platform from beneath the tarsi. It was then photographed, using the Edgerton high-speed motion picture technique, in head-on view, so that, by measuring in successive frames the angle between the costa of each wing and the horizontal, it is possible to obtain an accurate graphical representation of the vertical component of the stroke. The passage of time was recorded automatically on the film, by means of a sixty-cycle spark.

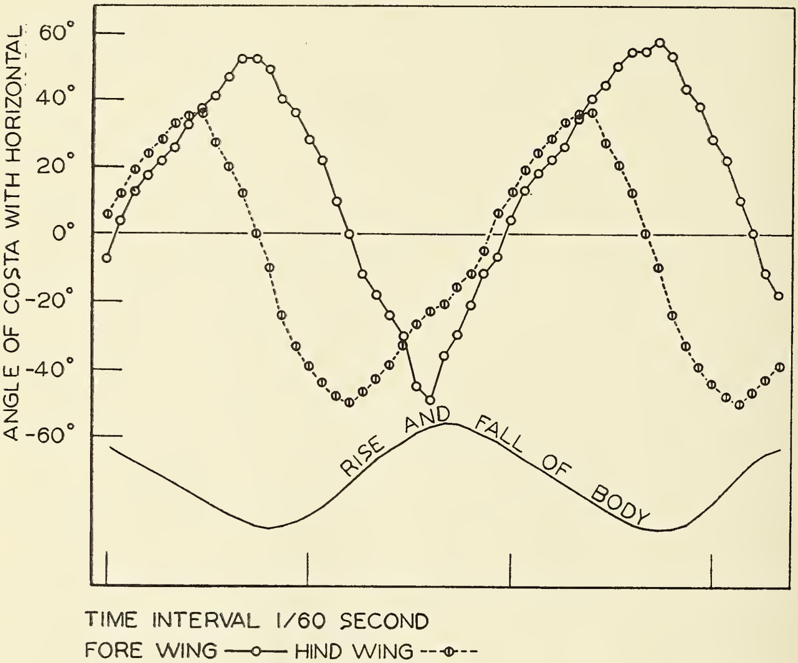
From this plot a number of calculations have been made, as follows:

The rate of wing beat is approximately 30 strokes per second (at 25° C.). The hind wing starts down approximately .005 second before the fore wing. The downstroke of the hind wing occupies .013 second and carries through 86° of arc, while the upstroke, which begins .007 second before the fore wing starts upward, occupies .020 second. The fore wing traverses 101° of arc; the downward phase of the stroke occupies .014 second, the upward phase, .019 second.

Since the wings of this specimen measured 3.2 cm. in length, it may be calculated further that the average speed of the tip of the fore wing (in a vertical plane) was 3.42 meters per second. During the downstroke, this rose to 4.07 meters per second, but dropped to 2.77 meters per second during the upstroke. Corresponding figures for the tip of the hind wing are: average speed, 3.01 meters per second; average speed during downstroke, 3.86 meters per second; average speed during upstroke, 2.16 meters per second. By including a horizontal component of about 3 meters per second, calculated from a similar series of pictures which show the animal in lateral view, the actual air speed of the wing tip may be reckoned as not more than 5 meters per second.

The specimen was fastened by the basal segment of the abdomen in such a way that the anterior part of the body was free to move upward and downward on the thoracico-abdominal articulation. By referring these movements to a fixed point in the field, it is possible to learn at what phases of the wing stroke a lifting force is being exerted. The lowest of the three curves in Figure 1 shows the result of these measurements, and, in correlation with the plots of the wing stroke above, reveals that practically all of the lift is obtained during the time when both wings are in the downstroke. But it must be remembered that these observations were made, of necessity, on a fastened specimen. During free flight, the forward translation of the body cannot fail to introduce a horizontal component into the oncoming current of air against which the wing is working. This change will not only modify the forces of lift and translation achieved through the action of the wing, but will also be met, in all probability, by appropriate reflex alterations in the shape of the stroke. The simplest possible vector analysis of the situation shows that, in a freely flying insect, a lifting force will be realized during both phases of the wing beat, but that the insect will be driven forward only during the downstroke. Speed of translation is increased, at the expense of lift, in proportion as the wings strike downward in a more nearly vertical direction, as Ritter (1911) pointed out.

Among the observations given above, there is only one point in which the wing stroke of the dragonfly differs fundamentally from that of other insects. Members of other orders whose wing motion has been studied and photographed start both the upstroke and downstroke with the fore wings in advance of the hind wings, but this procedure is reversed by the dragonflies. As a result, their hind wing meets the oncoming current of air before it has been troubled by the passage of the forewing, while there is no possibility, of course, of the hind wing's disturbing the current against which the anterior pair has to work. In this simple way, the dragonflies have attained a relatively efficient type of flight without resort to the more common expedient of suppressing the activity of one or the other pair of wings. The orthopteroid and lower neuropteroid insects, having developed neither of these improvements, survive as relatively weak flyers through specialization along other lines.



The high-speed motion pictures upon which this study is based were taken in collaboration with Professor Harold E. Edgerton of the Massachusetts Institute of Technology, assisted by grants from the Elizabeth Thompson Science Fund and from the Department of Biology of the Massachusetts Institute of Technology. The writer wishes to thank Mrs. A. B. Klots for determining the species of dragonfly used in this study.

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NOTES ON THE FEEDING AND BREEDING HABITS OF SAPERDA TRIDENTATA OLIV.

By L. L. Pechuman, Medina, N. Y.

While working on the scolytid beetles involved in the Dutch elm disease problem, the writer was able to secure considerable incidental information on the habits of other species attacking elm, although usually little time was available to conduct well controlled experiments with any of them. However, so little is known about the common and economically important elm borer *Saperda tridentata,* that it was thought advisable to present an abstract of the information secured about this species over a period of several years in southeastern New York. For the sake of brevity no reference will be made to the natural enemies of this species as that has been well covered by other workers.

In southeastern New York the first adults of *S. tridentata* appear in early May. Most of the emergence takes place the last week in May and the first week in June with an occasional straggler appearing until mid-July. The males always appear first from a given lot of material; for the first several days the emergence is usually wholly males, but females begin to appear in gradually increasing numbers until only females are found. The total number of each sex appearing from a lot of material is about equal.

In spite of the abundance of this species in certain areas, it is rarely encountered in the field during the day. It is most active at night and during the day secretes itself on the bark or among the foliage. Both sexes are often taken at lights at night.

Mating takes place soon after emergence and eggs may be laid three or four days after emergence. Before egg laying takes place the adults feed on the leaves, leaf petioles, or young twigs of elms in the vicinity. Such feeding may sometimes be quite extensive; the larger veins of the leaves are usually eaten and large holes may be chewed in the surrounding tissue; on the twigs and petioles the feeding is usually less noticeable as usually only the outer layer of tissue is destroyed. Sometimes, however, twigs are so nearly gnawed through that they break and fall or dangle by a strip of bark.

Since feeding by the adults is of primary importance from a standpoint of the transmission of the Dutch elm disease fungus, the writer attempted to determine whether such feeding is absolutely necessary for egg laying. In 1937 freshly cut elm logs were selected and sawed into shorter lengths, alternate sections being placed in the same cage. Adult male and female *S. tridentata* from a single source were secured and equal numbers of each were placed in the various rearing cages. In one set of cages fresh elm leaves and twigs were added and renewed at frequent intervals; in the other set no leaves or twigs were added. The insects fed extensively where food was provided and in all cases laid large numbers of eggs which produced normal larvae. Where no food was provided no eggs were laid. This experiment was done with two sets of cages in 1937 and was repeated with two more sets in 1938 and in no case were eggs laid where no food was present and in every case eggs were laid where fresh leaves were available. It is interesting to note in this connection that where no food was provided the insects were short lived, rarely living for more than a week; when allowed to feed the adults frequently lived from one to nearly two months.

In order to substantiate the above experiments, adult females of *S. tridentata* which had emerged from one lot of elm wood on June 10, 1938, were divided into two lots and placed at a constant temperature of 20° C. on June 11. Each insect was placed in a separate container and fresh elm leaves placed in half of the containers. Insects from each set of containers were killed and dissected at regular intervals. A few well developed eggs were found on June 14 in those that had been allowed to feed, and every specimen examined subsequently until June 24 when the experiment was discontinued had from four to twenty-four well developed eggs. Unfed specimens never developed eggs and all were dead by June 18,

Oviposition usually takes place at night. The egg slits are made in crevices in the bark; the slits may frequently be close together but only one egg is laid in each slit. The total number of eggs laid may vary considerably depending on the size and longevity of the female. Most of the individuals studied lived about a month under normal outdoor conditions and laid from fifty to sixty eggs during this period.

Fresh sappy wood is usually selected for oviposition. Freshly cut logs and weakened trees are especially susceptible to the attacks of *S. tridentata.* Probably perfectly healthy trees are not attacked although some workers think that they are. There is no doubt, however, that trees which externally show no weakened condition are frequently attacked by *S. tridentata,* the first sign of its presence being the thinning and dropping of the foliage followed by the dying of a branch or two. Such trees although apparently vigorous, are probably suffering from a food or water deficiency or possible root injury. Leaking gas mains in the vicinity may reduce the vitality of the tree sufficiently to make it susceptible to *S. tridentata* attack. However, once established in a generally debilitated tree or in an isolated branch suffering from some injury, the larvae may spread to the healthy portion of the tree. Under such circumstances the upper branches are usually killed first resulting in the stag-headed appearance so commonly seen, and the insects gradually work downward over a period of several generations until the whole tree is dead. When a tree suddenly begins to die from some other cause, all portions are attacked simultaneously from the trunk to branches only a few inches thick.

Immediately after hatching the young larva begins to tunnel transversely across the grain of the wood between the bark and wood. The young larva by its transverse tunneling frequently girdles the branch in which it is working. As the larva matures its tunnels meander in all directions reducing the inner bark and outer sapwood to a mass of granular frass. The tunnels form shallow channels in the sap wood and in fresh, moist wood may be almost wholly restricted to the inner bark. The writer has never found tunnels penetrating below the surface of the wood except in the construction of the pupal cell. By the time the larvae are well grown, large pieces of loosened bark may be easily striped from the tree.

From early August to mid-October most of the larvae begin the construction of pupal cells in which they will remain over winter and transform to pupae and adults the following spring. The pupal cell is usually constructed five or six mm. below the surface of the wood (exclusive of bark) and parallel with the grain. After the cell is completed the larva reverses its position so that it faces the opening by which it entered. This opening it plugs with fibrous frass. The larva usually makes no provision for the escape of the adult by gnawing an opening in the bark above the entrance to the pupal cell as is the case in some other members of the genus; it is occasionally done, however. Usually a certain percentage of the larvae construct an oval pupal cell between the bark and wood or, in thick barked trees, wholly in the bark.

In southeastern New York the first pupae are found in late April and early May. The length of the pupal period varies considerably. The first adults to appear in May have a pupal period of twenty-two to thirty-three days with an average of about twenty-four to twenty-seven days; adults appearing in June have a pupal period averaging from fifteen to eighteen days.

After transforming to an adult, *S. tridentata* may remain in the pupal cell as long as a week. The normal colors of the adult are attained and hardening of the integument takes place during the first twenty-four to forty-eight hours of this period. Emergence may or may not be by way of the frass filled tunnel leading to the pupal cell. Frequently the adult will gnaw an entirely new tunnel through the wood and bark or utilize only part of the larval entrance tunnel.

In sawed wood the adult often emerges through the end of the log if the pupal cell is within one half to three quarters of an inch of the end. Emergence is probably at least partly a response to outside temperatures and the adult takes the shortest possible route to the surface, apparently being guided by the temperature at the log surface. The emergence hole is somewhat oval and varies greatly in size, most of them being about 4 by 4½ mm. in diameter.

There is normally one generation a year, but individuals in wood that has dried out rapidly may take two or three years to complete their development. Even larvae from the same group of eggs may take one, two, or even three years to complete their development under conditions which are apparently identical. The writer has found no individual that required more than three years or less than one year to complete its development. On the other hand occasional individuals of the cerambycids *Neoclytus acuminatus* and *Xylotrechus colonus,* which are frequently associated with *S. tridentata,* develop from egg to adult in three to four months.

Larvae hatching from eggs laid in July and August by late emerging stragglers or especially long lived individuals, usually require two seasons to complete their development, but frequently a few individuals will emerge with the main *S. tridentata* emergence the following spring. It might be expected that adults derived from late laid eggs would emerge late the following season but apparently this is not the case; either they appear with the usual spring emergence or require an additional year to complete their life cycle.

Several workers have mentioned that three sizes of larvae are frequently found together in galleries and take this as presumptive evidence that the life cycle is probably three years, each size of larvae representing a distinct generation. It is extremely doubtful if *S. tridentata* will attack the same portions of a tree for three or even two years in succession as not only is fresh material preferred, but the first group of larvae would probably manage to consume most of the available food the first year. Since the writer has observed great variation in the size of *S. tridentata* larvae of the same age and even from the same lot of eggs, it is doubtful if the above mentioned observations on larval sizes are of much significance.

COLLECTING WITH A CAMERA.

By Edwin Way Teale, Baldwin, L. I., N. Y.

Photographs of living insects in their natural surroundings contribute both added interest and added value to a collection of mounted specimens. Such pictures record in vivid form facts about the living attitudes and habits of the insects. In effect, a good photograph of the kind arrests the creature in the midst of a story-telling action and permits us to examine it closely at leisure. The minimum requirements of a good insect picture are: It must record the subject large enough to show it in detail; and the subject must be in perfect focus.

Equipment. If we try to photograph even the larger insects with an ordinary folding camera or a box camra, we have to stand too far away; the subject is recorded on the film in pin-head proportions. In collecting several thousand insect pictures during the past ten years, I have tried reflex cameras, twin-lens outfits, miniature cameras and view cameras. The outfit that has best stood the test of time is a Zeiss Ideal, a 3¼ × 4¼-inch film-pack camera equipped with a Tessar lens, a ground glass back for focusing and a double-extension bellows. The latter feature enables you to get close to your subject. By adding two auxiliary lenses, each costing in the neighborhood of five dollars, you can possess a versatile outfit able to record four different types of insect pictures, ranging up to magnifications a dozen times natural size.

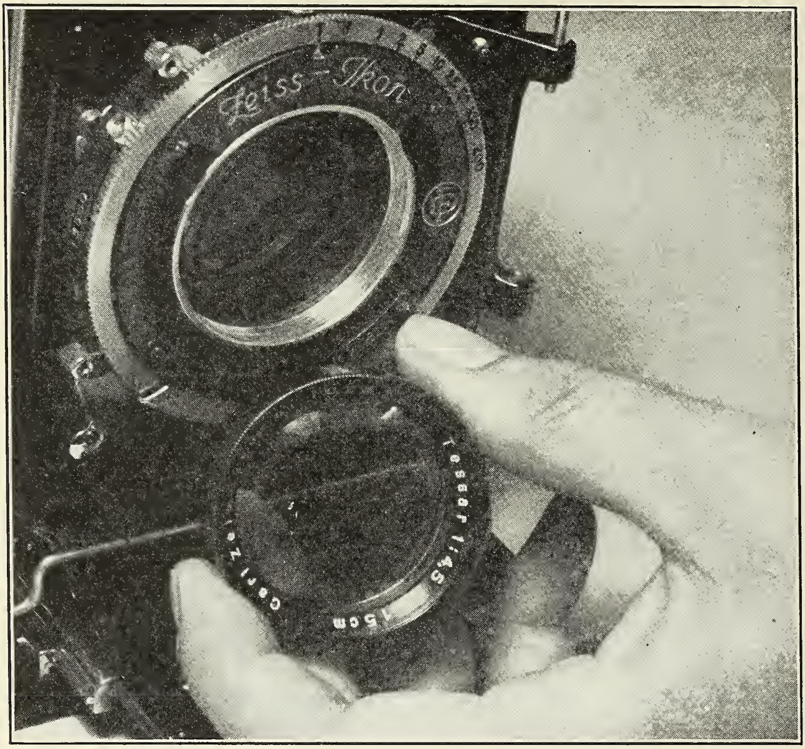
I. With the double-extension bellows pulled out, you can work close enough to your subject to record in sharp detail the larger insects such as butterflies, moths, katydids and praying mantes.

II. With a *proxar* lens slipped over the *Tessar* lens, you can bring your camera even closer and record crickets, grasshoppers, beetles and similar insects at approximately life size.

III. With the *proxar* removed and the front element of the *Tessar* screwed out, using only the rear element of the lens, you can snap pictures of smaller insects at nearly twice natural size.

IV. And, finally, with the *Tessar* and its shutter removed entirely and replaced with a one-inch-focal-length lens, you can record magnified pictures of insect heads and other parts, enlarged as through a microscope.

Such a lens, from a 16-millimeter home movie camera, can be purchased in a second-hand photographic store and easily mounted in a wooden holder to fit in the opening at the front of the camera which ordinarily holds the *Tessar* and its accompanying *Compur*

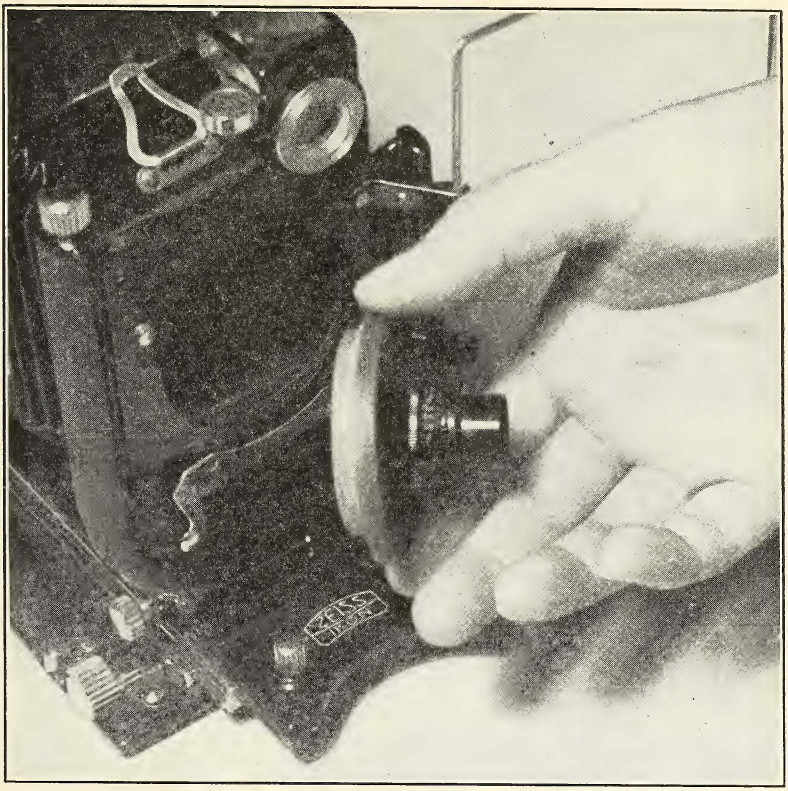


By screwing out the front element of the Tessar lens and using only the rear element, pictures approximately twice natural size can be obtained.

shutter. Such magnified pictures require photoflood lighting and rather long exposures. With supersensitive film and two photoflood lamps eight inches from the subject, I find sixteen sconds is an average exposure with the lens stopped down to f.16.

Using Equipment. Some general suggestions in connection with insect photography, whether you use this type of equipment or some other, may be of assistance.

Subjects. Any of the large silk moths, *Cecropia, Luna, Polyphemus, Promethea,* are excellent subjects for your first pictures. You can photograph them in the spring just after they have emerged and are hanging motionless. Moths that emerge indoors from collected cocoons can be placed on appropriate backgrounds and photographed near a window or by photoflood or photoflash illumination. The less active insects, the praying mantes, katydids,



One-inch lens, in its wooden mount, being slipped into place after the Tessar lens and Compur shutter have been removed.

etc., also offer good chances of early success.

Focus. You can either focus on a plant and await the coming of a butterfly or stalk these insects in the open field. Dr. Otto Croy, a noted German nature photographer, equipped his camera with a slender rod projecting a certain number of inches beyond and below the lens. With the camera sharply focused at this distance, he stalked his subjects, approaching carefully until the end of the stick was below and in line with the insect. Then he snapped the shutter, sure his picture was in focus. You can also focus on a plant and then place an insect where you want it. Aids to keeping the subjects quiet will be discussed later. It is wise to "stop down" always, when possible. The chances of getting a sharp picture with the camera set at f.32 are usually much greater than at f.4.5. The smaller the diaphragm opening, the greater the depth of focus, or distance from the nearest to the farthest object in the picture in perfect focus. Because you are working so close to your subjects, your depth of focus normally is very shallow.

Tripod. A camera focused while on a tripod is in no danger of moving just as the shutter is snapped and thus spoiling the picture. The average of good pictures will go up almost invariably if the amateur learns to stop down and to use a tripod.

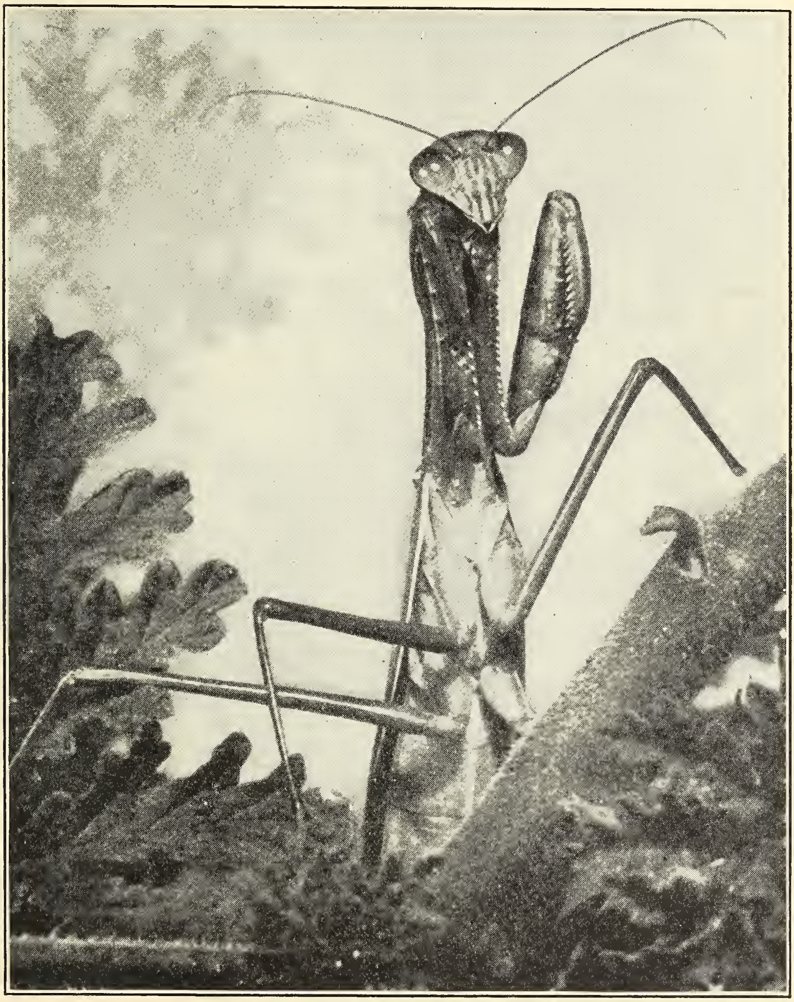
Stopping Motion. If the subject moves, the picture is blurred and spoiled. So care must be taken to snap the shutter when the subject is motionless. Incidentally, because the image is magnified oftentimes in insect work, the movement is correspondingly magnified and extra care is needed to avoid blurred pictures. Some insect photographers have used a little ether or fumes of ammonia to quiet the insect and make it cling quietly in one position while the picture is taken. I have found that taking moth pictures in the daytime and butterfly pictures at night, by artificial light, reduces the chance of movement. The insects are naturally less active at such periods. Placing an insect subject in an icebox for a few minutes will sometimes slow down its activity so the desired picture can be made. Winds seem to spring up as soon as the insect photographer starts work, swaying the foliage and increasing the difficulty of stopping motion. Cloth shelters can sometimes be constructed around the plant. Or the plant can be brought indoors and the picture made by photoflood illumination.

Magnified Pictures. Such long exposures are required for pictures of parts of insects made with the one-inch lens and the double-extension bellows, that only killed specimens can be used. The simplest method of getting the subject in focus is to place the dead insect on the end of a piece of modeling clay which has been drawn out into a gooseneck. This can be moved about until the subject is directly in line with the little lens.

Film. Supersensitive panchromatic film has two advantages: It is sensitive to all colors including red and so records pink or reddish markings on insects as varying shades of gray. Other "colorblind" films show them all as black. Also, its higher speed enables you to give shorter exposures, thus lessening the chances of movement, and at the same time stop down and increase the chances of getting everything sharply in focus.

Developer. For developing insect negatives, a fine-grain formula, such as D76, is preferable. It enables you to enlarge a small section of your negative, if you desire to do so, without having the resulting picture marred by graininess.

Enlargements. Oftentimes, in enlarging your best negatives you can produce a more interesting or striking picture by using only part of the picture originally photographed. If you are preparing your pictures for reproduction, or if you desire to show maximum detail, it is best to make the enlargements on glossy paper rather than on varieties having a matte or semi-matte surface.



The Hour of Prayer—for more. Photo by Edwin Way Teale.

NEW NORTH AMERICAN MYRMECOPHILOUS SCARABAEIDAE (COLEOPTERA—CREMASTOCHEILUS).

By Mont A. Cazier, Berkeley, California.

The present paper is an attempt to correct the status of various species and genera in the *Cremastocheilini* as well as to make known a number of previously undescribed species.

The author would like to extend his sincere thanks and appreciation to Dr. E. A. Chapin of the United States National Museum for the loan of material in his charge, to Mark Robinson for the loan of specimens from his fine private collection, and to Dr. R. H. Beamer of the University of Kansas for the loan of specimens from the Snow collection. Thanks are also due Mr. H. C. Fall for the loan and privilege of dissecting a specimen of the uncommon *Psilocnemis leucosticta* Burm.

In a recent paper by the author[1] the genus *Psilocnemis* was incorrectly placed as a synonym of *Genuchinus*. A subsequent study of specimens kindly loaned to the author by Mr. Fall has shown that the genus is distinct from any of the other known North American genera. The male genitalia are distinctive and the hind wings are like those of *Lissomelas* and *Genuchinus*. The new generic key to follow will point out additional salient characters. A description of *P. leucosticta* is also included as the original is brief and often unavailable.

Key to the North American Genera and Subgenera of Cremastocheilini

1. Anterior angles of pronotum each with a sinus at apex; vein R3 of hind wings terminating on membranous posterior portion of wing 2
   Anterior angles of pronotum entire; vein R3 of hind wing terminating on costal margin 3
2. Anterior tarsi without dilated fourth and fifth segment; head without lateral carinae .... *Cremastocheilus*
   Anterior tarsi with fourth and fifth segments dilated; head with lateral carinae .... subgenus *Macropodina*
3. Median dorsal surface of scape flat or convex; tarsal constrictions visible, segments not overlapping distally *Genuchinus*

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[1] Cazier, M. A., Bul. So. Cal. Acad. Sci., 37: 86.

Median dorsal surface of scape concave; tarsal constrictions not visible, segments overlapping distally 4

4. Tarsi sculptured with longitudinal carinae; anterior margin of clypeus acute, beneath with median deep depression *Lissomelas*

Tarsi smooth, without carinae; anterior margin of clypeus not acute, prolonged beneath into a wide smooth, flat plate, without median depression. (Fig. 1 and 2) *Psilocnemis*

Psilocnemis leucosticta Burm.

P. leucosticta Burm., Handbuch der Entomologie, 42: 677.
P. polita (Schaum), Germ. Zeitschr., 44: 397.

Medium sized, robust, black; pronotal disk with pale yellow bloom laterally, basal half of side margins with the bloom, elytra irregularly bordered with bloom along side margin above reflexed edge. *Head* shining black, occiput with narrow transverse band of bloom extending from margins of eyes, front sparsely, shallowly, punctate, punctures separated by about twice their own widths, becoming obsolete anteriorly, two shallow impressions in front between insertions of antennae; clypeus sericeous, impunctate, sides wider than front between eyes and nearly as wide as width across canthi, front margin at middle prominently reflexed, laterally less so, margin beneath shining black, impunctate; mentum cupuliform, shining black, impunctate, basal margin with prominent median angulation, sides acutely angulate; antennae with triangular scape depressed medially, club three-segmented, as long as scape. *Pronotum* with sides obtusely rounded, widest at apical third, margins acute and prominent, front and hind margins without sinuses, disk opaque, lateral front angles and narrow front margin shining black, sparsely punctate, punctures separated by about four times their own diameters, disk with front and sides bordered with irregular band of bloom which extends to basal side margin, basal margin with prominent depression on either side of middle. *Elytra* with humeral umbones and reflexed side margins shining black, disk opaque and surrounded by an irregular, rather wide band of light yellow (straw colored) bloom, broken only at umbones, punctures acutely lunate, separated by about twice their own widths. *Beneath* shining black, bare, sparsely covered with oblong punctures and depressed lines, tarsi shorter than tibiae, outer edge flat, sides acute, inner apical edge prominent; pygidium densely punctate basally, sparsely towards apex, punctures varying from depressed lines to round punctures with elevated centers.

Length 13 mm., width 6 mm.

Clarendon Co., near Santee River, August 1 to 9, 1896.[2]

Cremastocheilus (*Macropodina*) *planata* Lec. 1863

C. (*Macropodina*) *planata* Lec., Smiths, Misc. Coll., 66: 81.

C. (*Macropodina*) *depressa* Horn, Trans. Amer. Ent. Soc., 3: 340.

C. (*Macropodina*) *ampla* (Csy.), Memoirs on the Coleoptera, 6: 346 (new syn.).

A recent study of the types of the members of this subgenus has disclosed the fact that C. *ampla* Csy. is synonymous with Leconte's C. *planata.* The latter species was described from Arizona and the former from Coastal California (Alameda Co.). The author has in his collection a specimen of *planata* from Big Pine, Inyo Co., Calif., June 8, 1937 (A. P. Yerington), and since this locality is about mid way between the type localities of *planata* and *ampla* and the two forms are conspecific it would indicate a rather wide distribution for *planata.* Typical *planata* was recently collected on the Francis Sims Hastings Natural History Reservation, Santa Lucia Mts., Jamesburg, Monterey Co., California, June 13, 1938 (C. D. Michener).

A number of species have been confused with members of this subgenus, some being incorrectly called *ampla* and others *planata.* The author has been fortunate in obtaining loans of these various species and is here attempting to clarify this rather complex situation. Since *ampla* is, without question, a synonym of *planata* these additional species are apparently without names. Two of these are here described as new.

Cremastocheilus (Macropodina) puncticollis Cazier, sp. nov.

Large, robust, black; elytral disk nearly impunctate. *Head* sparsely punctate, punctures separated by two to three times their own widths, lateral carinae extending along inner margins of eyes, median carina extending to clypeal margin, reflexed portion of front and clypeus with a narrow patch of tomentum at base on either side of median carina, base of head with deep transverse impression; canthus inconspicuous, glabrous; clypeus unequal to width of head at eyes, rounded

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[2] Liebeck, C., Ent. News, 99: 243.

in front, prominently reflexed; mentum cupuliform, shallow, anterior margin evenly rounded, sides subangulate, posterior margin produced at middle into prominent point; antennae ten-segmented, scape large, dorsal surface flattened. *Pronotum* two-thirds as wide as elytra at base, side margins straight, divergent from base to apical third, then obtusely rounded to apical nodes, widest at apical third, basal angles noduliform, anterior median impression shallow, basal median impression deep, surface evenly convex, sparsely punctate, punctures shallow, separated by two to three times their own widths. *Elytra* widest at humeral angles, side margins flexed downward, sinuate behind umbone, subparallel to apical sixth and then evenly rounded to apex; disk smooth except for few irregular, small punctures and shallow scratches, side margins irregularly punctate, apical umbones prominent; scutellum extending to basal third, sharply pointed apically, surface with sparse lunate scratches; meso-episternum prominent, not flattened dorsally. *Beneath* sparsely punctate; femora and tibiae densely punctate, front tarsus with fourth and fifth segments enlarged, middle tarsi normal, hind legs missing, front tibiae bidentate distally; pygidium subcylindrical, sparsely, irregularly punctate.

Length 14 mm., width 6 mm.

Holotype male in the author's collection, collected at Tuba City, Arizona, July 8, 1937, by Mr. R. P. Allen to whom the author is greatly indebted for the type specimen. One male paratype taken at Deep Springs Lake, Inyo Co., California, June 15, 1937, by Mr. J. W. Johnson and very kindly presented to the author.

The paratype specimen differs from the holotype by having the elytra piceous rather than black and by its larger size. Length 15.5 mm., width 6 mm. The piceous color of the elytra may be due to bleaching or immaturity. The specimen was found dead and lacks all the tarsi and the middle and hind legs on one side.

C. puncticollis is closely related to *C. planata* but differs from it by its reduced and sparse punctuation throughout, by the shape of the pronotum which has the side margins angulate at apical third rather than evenly rounded as in *planata.* The apical angles are not as deeply incised before the nodes as in *planata.* In the available specimens of *planata* the clypeal-frontal tomentose area is absent. However, this may be variable. In *puncticollis* the third tarsal segment of the front legs is connected to the fourth at about the middle of the posterior margin of that segment and the fifth segment is rounded laterally, whereas in *planata* the third segment of the anterior tarsus is connected to the fourth at the extreme outer corner of the posterior margin of that segment and the fifth segment is laterally flattened proximally.

Cremastocheilus (Macropodina) beameri Cazier, sp. nov.

Medium sized, robust, black. *Head* with vertex moderately punctate, punctures separated by about their own widths, front with larger nearly confluent punctures, lateral carinae extending along the inner margins of eyes prominent, median rounded carina extending to clypeal margin, base of head with deep transverse impression; canthus relatively inconspicuous, sparsely clothed with short pile; clypeus reflexed, slightly emarginate at middle above carina, unequal to width of head at eyes; mentum cupuliform, shallow, anterior margin evenly rounded, sides subangulate, posterior margin produced at middle into prominent point; antennae ten-segmented, scape large, dorsal surface shallowy convex. *Pronotum* four-fifths as wide as elytra at base, side margins evenly rounded anteriorly, nearly straight at base, widest at apical third, basal and apical angles noduliform, anterior median impression shallow, posterior impression rather deep; disk with shallow, longitudinal, median impression, surface irregularly punctate, punctures generally separated by about one-half their own widths, open areas often present, laterally more densely punctate. *Elytra* widest at humeral angles, side margins slightly sinuate behind umbone, subparallel to apical sixth then evenly rounded to apex, disk concave, sides rather sharply elevated, large subcylindrical ring-like punctures densely covering surface, often coalescent; scutellum extending to about basal third, sharply pointed posteriorly, sparsely covered with lunate impressions; meso-episternum not flattened above. *Beneath* rather densely covered with lunate impressions, sparsely pilose; legs long, compressed, anterior tibiae bidentate apically, fourth segment of anterior tarsus with upper surface only one-third as long as ventral surface, third segment attached to fourth below upper proximal corner; pygidium subcylindrical, punctures separated by about one-third their own diameters, median carina prominent.

Length 13 mm., width 5 mm.

Holotype male in the collection of the University of Kansas, collected at Douglas, Arizona, San Bernardino Ranch, 3750 ft., August, by F. H. Snow and loaned to the author by Dr. Beamer, after whom the species is gratefully named. One topotypical male paratype in the author's collection and one male paratype collected in Pima Co., Arizona, Sept. 11, 1914, in the collection of Mark Robinson.

This species most closely resembles *planata* from which it can, however, be distinguished by its smaller size and narrower form. In *beameri* the dorsal surface of the fourth anterior tarsal segment is much shorter than the ventral surface of that segment, whereas, in *planata* the two surfaces are subequal. Also in *beameri* the third segment of the anterior tarsus is attached to the fourth below the upper proximal corner. In *planata* the third segment is attached to the fourth at the proximal dorsal corner.

The anterior tarsi of *beameri* resemble those of *puncticollis* except that the fifth segment is laterally flattened basally in the former and not in *puncticollis*. It can be further separated from *puncticollis* by its large and dense pronotal and elytral punctures. In *puncticollis* the pronotum has sparse, small punctures and the elytra are nearly impunctate but with occasional irregular scratches.

Cremastocheilus constricticollis Cazier, sp. nov.

Medium sized, elytra moderately robust, pronotum slightly more than one-half as wide as elytra; thorax and elytra piceous, head and legs reddish. *Head* with vertex moderately densely punctate, punctures separated by about their own widths, front with transverse impression in front of eyes, front and impression clothed with golden pile, median carina prominent, glabrous dorsally, sides with pile behind and a tomentose patch on either side in front but behind reflexed clypeal margin; clypeus impunctate, as wide as head and strongly reflexed, median reflexed portion extending posteriorly and connecting with carina; mentum cupuliform, front and side margins evenly rounded, posterior margin medially produced into an acute point. *Pronotum* slightly more than one-half as wide as elytra, side margins evenly, obtusely rounded, anterior angles auriculate, inner notch moderately deep, posterior angles acute, straight; surface with median portion opaque, impressed, sparsely, irregularly punctate, lateral surfaces elevated, shining, densely rather deeply punctate. *Elytra* opaque, side margins subparallel, evenly rounded to apex, surface densely covered with elongate punctures, which are nearly coalescent longitudinally and separated by about their own widths transversely. *Beneath* bare, sparsely punctate, anterior tibiae bidentate, posterior tooth distad to middle, tarsi five-segmented, laterally flattened; pygidium roughened, without regular punctures, dorsal two-thirds opaque, ventral one-third shining.

Length 11 mm., width 4.5 mm.

Holotype female in the collection of Mark Robinson, collected at Bonita, Graham Co., Arizona, from the collection of Charles Schaeffer.

This species belongs with the species in the *trinodia* group but is apparently only distantly related to any previously described. It can be separated from all other species by its narrow pronotum, and the transverse impression on the front of the head.

Cremastocheilus robinsoni Cazier, sp. nov.

Rather large, robust; uniform reddish-brown throughout. *Head* with vertex shallowly, sparsely punctate, punctures separated by about their own widths, front projecting outward from eyes, parallel with reflexed margin of clypeus, pointed medially, lower anterior portion abruptly descending to clypeal margin, upper portion deeply, densely, irregularly punctate, lower portion with large impunctate opaque areas laterally, the lower and lateral portion tomentose; reflexed clypeal margin nearly as wide as head, impunctate; antennal scape large, concave; mentum cupuliform, posterior margin produced medially. *Pronotum* about three-fourths as wide as elytra, widest at basal third, sides irregularly rounded anteriorly, anterior angles bluntly produced, inner depression rather deep, posterior angles noduliform and produced outward; an elevated area at basal third of surface, gradually descending to anterior margin, elevated portion densely covered with large shallow punctures, coalescent or separated by about one-sixth their own widths, becoming sparse anteriorly to impunctate area along margin. *Elytra* elongate, robust, side margins subparallel; surface punctate with elongate ring-like punctures, punctures separated laterally by about their own widths; meso-episternum prominent above, middle shallowly concave. *Beneath* glabrous, rather sparsely, lunately punctate; pygidium subcylindrical, irregularly punctate, punctures cylindrical; front tibiae bidentate, nearly impunctate, tarsi moderately flattened laterally.

Length 15 mm., width 6 mm.

Holotype female in the collection of Mark Robinson, collected at Lerdo, Durango, Mexico (Wickham), and turned over to the author for description by Mr. Robinson after whom it is gratefully named.

This species is only remotely related to the other members of *Cremastocheilus* previously described from North America. Its salient characters are the front of the head which is produced and angulate, and the large, concave, meso-episternum. The prothorax resembles somewhat that of *C. nitens* Lec. but the side margins are not serrated and the front angles are more produced. In *nitens* the posterior declivity is more pronounced.

Cremastocheilus mentalis Cazier, sp. nov.

Medium sized; dark, opaque red, rather densely clothed with long brown pile; legs strongly compressed laterally. *Head* with vertex and front cribrately punctate, punctures shallow; frontal carinae prominent and extending to reflexed clypeus, densely clothed with long brown pile, two small apical tomentose patches, one on each side; clypeus as wide as head, sides of reflexed front margin serrate, clothed with long brown pile; mentum cupuliform, subcylindrical, posterior reflexed margin abruptly elevated posterior to lateral obtuse angles, median portion prominent, acutely angulate and abruptly elevated. *Pronotum* trilobed, widest at apical third, sides obtusely rounded to apex and base, not greatly constricted, edges shallowly serrate, apical angles auriculate, basal angles projecting posteriorly, impunctate, shining; surface opaque, except for hind angles, lateral lobes cribrately punctate, middle with irregularly placed rather dense pile and shallow, circular punctures. *Elytra* with sides subparallel, disk shallowly concave, densely covered with oblong punctures, separated by about their own widths laterally, coalescent or overlapping longitudinally, each puncture giving rise to a long brown hair; meso-episternum inconspicuous above. *Beneath* rather densely covered with shallow ring-like punctures and brown pile; all femora and tibiae greatly compressed laterally, moderately clothed with brown pile, anterior tibiae bidentate, middle and hind tibiae with subapical acute spine on outer edge, tarsi five-segmented, flattened laterally; pygidium subcylindrical, median line faint, surface densely punctate and pilose dorsally, becoming sparse ventrally, ventral tip shining.

Length 12 mm., width 5 mm.

Holotype female in the author's collection, collected by Mr. E. R. Leach at Nogales, Arizona, Sept. 6, 1928.

A number of specimens of this species have been seen, by the author, in various collections incorrectly determined as *C. planipes* Horn. *C. mentalis* differs from *planipes* by being smaller, reddish rather than piceous, by having the punctuation of the head much more dense, the front much more pilose and the hind angles of the pronotum flat above rather than having the outer edges upturned. The compressed legs, mentum and punctuation of the elytra resemble closely those of *planipes*.

Cremastocheilus chapini Cazier, sp. nov.

Medium sized, moderately robust, piceous. *Head* with vertex and front deeply, irrgularly, confluently punctate, canthus prominent, extending on front, free end with few short hairs; clypeus as wide as head at eyes, sparsely, finely punctate, front margin semicircular, widely reflexed, sparsely clothed laterally with short stout hair, not carinate medially; antennae ten-segmented, scape large, dorsal surface concave; mentum cupuliform, anterior margin quadrately impressed, lateral angles prominent, posterior margin evenly rounded. *Pronotum* about two-thirds as wide as elytra, side margins obtusely, evenly rounded, widest at about middle, anterior angles blunt and with rather deep quadrate sinuses inside, anteriorly, shallowly auriculate, posterior angles deeply impressed, noduliform; surface with large, shallow punctures separated by about their own widths, sparsely clothed with short, stout setae posteriorly. *Elytra* widest at humeral angles, side margins reflexed downward, sinuate behind humeral umbone, subparallel to apical sixth and then evenly rounded to apex; disk with large, shallow, setigerous punctures which are separated by about their own widths, laterally with punctures deeper and more dense, surface with irregular, elevated, rounded ridges between punctures, setae short; scutellum extending to about basal third of elytra, narrowly pointed posteriorly, surface sparsely punctate apically, densely punctate basally; dorsal portion of meso-episternum prominent, flattened. *Beneath* shining, sparsely hirsute and punctate; anterior tibiae bidentate, middle and posterior tibiae rounded, anterior tarsi rounded, middle and posterior tarsi somewhat flattened laterally, all femora somewhat flattened, tarsi five-segmented; pygidium subcylindrical, irregularly covered with large shallow punctures.

Length 11 mm., width 5 mm.

Holotype female in the collection of the United States National Museum, collected at Yuma, Arizona, August 1902 by H. H. Brown and loaned to the author for study by Dr. E. A. Chapin after whom the species is gratefully named.

This species appears to be most closely associated with *C. nitens* Lec. but differs from that species by having the anterior angles of the pronotum much less constricted, the side margins more obtusely bent, the front angles not pointed, and the anterior sinuses deeper and quadrate. *C. chapini* has the posterior margin of the mentum evenly rounded, whereas, in *nitens* it is distinctly produced and pointed. The elytral punctures in *chapini* are larger and more closely placed than in *nitens*.

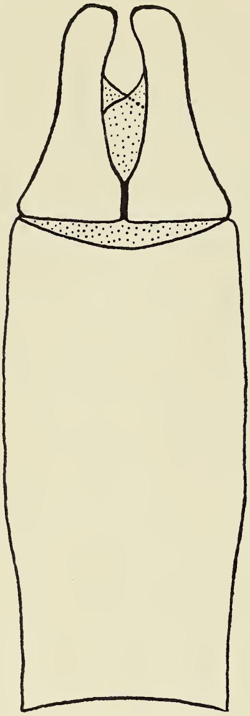
Cremastocheilus pulverulentus Cazier, sp. nov.

Medium sized; dark reddish-brown; pronotum, elytra, thoracic sterna, apical margins of abdominal segments and all femora pulverulent. *Head* coarsely, rather closely punctate, front with prominent lateral impressions opposite base of antennae, declivity to clypeus abrupt; clypeus wider than head, reflexed only at center of front margin; mentum cupuliform, wider than long, hind margin strongly reflexed, front margin scarcely so. *Pronotum* widest at middle, margin evenly, obtusely rounded, posterior angles noduliform, anterior angles bluntly rounded, with rather deep inner sinus; surface rather irregular, median portion somewhat impressed, median impressed line faint, large, rather deep setigerous punctures separated by about one-half their own widths, approximate laterally; entire surface except for angles covered with a bloom, angles shining. *Elytra* with sides subparallel; surface nearly flat, apical umbones prominent, setigerous punctures large, rather deep, separated by about their own widths laterally, entire surface covered with bloom. *Beneath* rather densely, setigerously punctate; abdominal segments one to four with apical band of bloom, each band about one-fourth as wide as segment; legs rounded, not greatly compressed, femora only moderately so, front tibiae bidentate distally, middle and hind tibiae with sharp median spine on outer edge, tarsi rather short, somewhat compressed; pygidium subcylindrical, dorsal portion with large, deep, close set punctures, pulverulent, ventral third shining, sparsely, minutely punctate.

Length 12.1 mm., width 5 mm.

Holotype female in the collection of the United States National Museum, collected in New Mexico.

Most closely associated with *C. crinitus* Lec. in the extent of the clypeus, shape of mentum, and punctuation but distinguishable by its evenly rounded side pronotal margins, unraised elytral interspaces, and relatively sparse pile. *C. pulverulentus* can at once be



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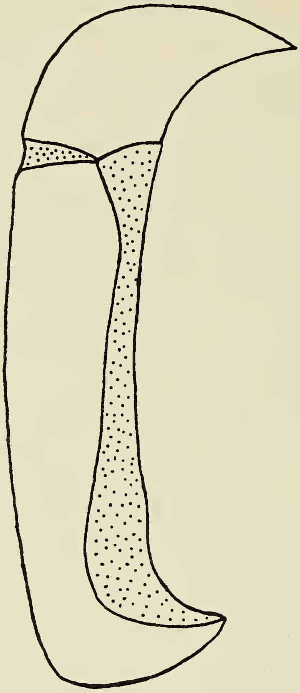

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Fig. 1. Male genitalia of *Psilocnemis leucosticta* (dorsal view).
Fig. 2. Male genitalia of *Psilocnemis leucosticta* (side view).

distinguished from all described species in the genus by the bloom covering portions of the head, pygidium and legs, all of the thorax and elytra and the apical edges of the first four abdominal segments.

Cremastocheilus excavatus Cazier, sp. nov.

Medium sized; dark red, opaque. *Head* shallowly, indistinctly, irregularly punctate; clypeus as broad as head, impunctate, front margin reflexed, median carina small, not extending to upper clypeal margin; mentum somewhat cupuliform, side angles not reflexed, remainder with reflexed margins. *Pronotum* widest at apical third, sides evenly rounded to auriculate apical angles and to deep sinuation anterior to acutely pointed basal angles; surface deeply trilobed, a deep excavation inside and anterior to each basal angle; surface with irregular, indistinct, shallow impressions. *Elytra* with sides subparallel; disk shallowly concave, surface with rather dense, irregular, shallow, angulate punctures and lines, sparsely clothed with short brown pile. *Beneath* sparsely punctate and pilose; all femora wide, compressed, anterior tibiae moderately convex, middle and posterior tibiae compressed, all tibiae subpedunculate, anterior pair bidentate externally, middle and hind pairs with acute tooth about middle of outer edge, tarsi short, rounded, segments subequal; pygidium large subcylindrical, irregularly lined on surface.

Length 10 mm., width 4.1 mm.

Holotype male in the collection of the United States National Museum, collected by H. F. Wickham at Durango, Mexico. Paratype male collected at Tlalnepantla, Mexico, by O. W. Barrett in the author's collection.

This species most closely resembles *C. saucia* Lec. but can be readily distinguished by its more robust shape, opaqueness, irregular sculpturing throughout, and by its lateral deeply excavated hind pronotal margin.

SOME REFLEX RESPONSES OF RANATRA FUSCA TO CONTACT STIMULI.

By Cyril E. Abbott, Searcy, Ark.

The following notes, made some years ago, on the reflex responses of normal and amputated specimens of *Ranatra fusca* may prove of interest to students of insect physiology.

While swimming, Ranatra moves each pair of legs in unison; but each pair moves *alternately* with the other pair; that is, as one pair moves forward, the other pair moves back. Often the raptorial legs are alternately extended and flexed. When stroked, the fore legs are stiffened, extended forward; excepting the terminal segment of each leg, which is flexed. At the same time, the remaining legs are extended forward.

This "reaching" response of the middle and last legs disappears when the nerve cord is cut through in the prothoracic region. Both normal specimens and those with severed cord swim forward when the body or breathing tubes are touched.

Destruction of the thoracic ganglion results in cessation of all response in the meso- and metathoracic legs, but leaves the motions of the head and prothoracic legs unaffected.

When placed upon a solid, level surface, specimens completely amputated at the prothorax exhibit tetany; the animal remaining elevated, with only the tarsi and breathing tubes in contact with the substratum, the middle legs slightly flexed at the femoro-tibial joint. When stroked, the middle legs are elevated and extended forward. The metathoracic legs, when stroked, are extended *without* being elevated, so that the animal resembles a tripod: this reaction may accompany the elevation of the mesothoracic legs if the two pairs are stroked in rapid succession.

Stimuli applied to any part of the amputated prothorax and head result in complete flexure of the fore legs.

Headless specimens (the wound sealed with collodion) live for several days, performing normal swimming movements. Such specimens are more sensitive to contact than are normal specimens, often swimming for hours; even when quiet a slight stimulus results in active swimming movements. Similarly, the proboscis of a specimen amputated at the prothorax moves from side to side for long periods, resuming this act on when stimulated either by contact or chemically.

When a few drops of dilute acetic acid are added to a small tank containing a headless specimen, the latter rubs the raptorial legs over one another, as if to remove irritation. Normal, unamputated specimens never exhibit this behavior, even when the concentration of acid is several times that which produces the reaction in headless specimens.

CALYCOPIS BEON (CRAMER), A NEW BUTTERFLY RECORD FOR THE UNITED STATES (LEPIDOPTERA-LYCAENIDAE).

By William D. Field, Lawrence, Kans.*

The writer recently has had the opportunity of studying long series of *Calycopis beon* (Cramer) from various localities in Texas. This species has never before been recorded north of Jalapa in Vera Cruz in eastern Mexico or Mazatlán in Sinaloa on the west coast of Mexico. The similarity of *C. beon* (Cramer) to *C. cecrops* (Fabricius) and the apparent abundance of *beon* in Texas leads the writer to the conclusion that *beon* has long been present in Texas but has heretofore passed for *cecrops*.

Short descriptions of *cecrops* and *beon* are given below for comparative purposes.

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* Contribution from the Department of Entomology, University of Kansas, Lawrence, Kansas.

Calycopis cecrops (Fabr.)

The males of this species are entirely brownish black above or sometimes with a slight amount of blue in the base of the hind wing. There is a bluish white marginal line below vein Cu_2 in each of the hind wings on this surface. In the female the lower half and entire base of the upper side of the hind wing is blue in color. There is a marginal bluish white line extending from vein M_3 to the anal angle and two large black spots near the margin in interspaces Cu_1 and Cu_2 on the upper side of the hind wing in this sex. Underneath in both sexes the mesial red band placed along the inner side of the white and black line is rather broad and is nearly the same width in the fore wing as it is in the hind wing. There are two marginal black spots on this surface, one each in interspaces M_3 and Cu_1. These marginal black spots are lined on the inner side with gray that is faintly tinged with red. The anal spot is black and is lined above with white and red.

Note—This species is found from Florida north to Maryland and West Virginia and west to Missouri and Louisiana.

Calycopis beon (Cramer)

The males of this species are supplied with a considerable amount of blue in the posterior part of the hind wing. The females are slightly more bluish than the females of *cecrops* and the blue color often extends into the base of the fore wing. Underneath the mesial red band is not as wide as in *cecrops* and tapers toward the costal margin of the hind wing. In the fore wing this band is greatly reduced in width. There is a small amount of red on the outside of the submesial black and white line in interspace Cu_2 of the hind wing. The black spots in interspaces M_3 and Cu_1 are much smaller than in *cecrops,* being, in fact, mere points. There is a red lunule on the inside of each of these two black points.

Note—This species extends from southern Texas south through Mexico and Central America into Brazil. The writer has studied specimens of *beon* from Donna, San Antonio and Concan, Texas.

A NOTE ON ENTOMOLOGISTS' GREEK.

By Wm. T. M. Forbes, Cornell University, Ithaca, New York.

The Hymenoptera and many other insects have a pair of furrows running back from the anterior margin of the mesotergum. These have long been known as the parapsidal furrows, but as noted long since by Morley ('03) and more recently by Tulloch ('29), Snodgrass ('37, though not yet in 1927) and others, this is a misuse of the term, and the term *notauli* has gradually been coming into use for them.

I cannot trace the first use of this term. Tulloch credits it to Kokouyew '98, but I have not been able to trace the use; and have found it first in the glossary of Morley's "Ichneumonologica Britannica (1903). Recently Snodgrass in the "Principles of Insect Morphology" has claimed that it is "evidently a misspelling of *notaulices,*" and adopts this spelling. What are the facts?

I cannot find that the name was ever formally proposed, or that any derivation was stated by its earlier users. Obviously the first part is the Greek word νῶτος, back. And as obviously, the second part is some derivative or cognate of the related Greek words: αὐλή (corridor), αὐλός (pipe), αὖλαξ (furrow), αὐλών (glen) or the like. It is equally clear that unless he made a misprint, the author intended to use the word αὐλός, whose normal meaning is pipe, especially as a musical instrument;—and this is the word which Yonge's English-Greek dictionary cites as the Greek word for "groove." Snodgrass obviously has in mind a Greek (or possibly Latin) word αὖλιξ, *aulix*.

A survey of many dictionaries produces the following surprising result:

1. There is no word αὐλιξ or *aulix,* meaning groove or anything remotely resembling that meaning. Some manuscripts of Vegetius show *aulix* at one of three places, to mean "furrow," but in the other two places *aulax* (a poetic Greek word for furrow) appears, and the modern Latin authorities seem to agree that "aulix" is a mere misspelling. So it disappears as a Latin word.

2. On the Greek side αὖλιξ appears just once in the whole Greek literature, in Hesychius' great dictionary; but its meaning is given not as groove, but vein (φλέψ),—it is utterly unknown in context, and as our single surviving manuscript of Hesychius is not too perfect it may even be a ghost-word too. The editor suggests αὖριξ instead.

3. The meaning "groove" for αὐλος is likewise not too sound. Though Yonge's dictionary credits it to Xenophon and Herodotus,

Liddell and Scott do not cite any ancient use of the word with that meaning,—the nearest is in the Odyssey, where it is apparently used for the groove on the clasp of a safety-pin which holds the point of the pin.

4. The ordinary word for "groove" in Greek seems to be αὐλών, which is normally the word for a ravine or perhaps a meadow, but which also actually occurs to mean a crease in an elephant's hide.

5. The ordinary word for a furrow (of a plow, but also used figuratively) is ὁλκός. There is also αὖλαξ, the word that Vegetius used, and which generated that ghost, *aulix*. This is generally defined as "furrow" but an ancient definition suggests that its true meaning may have been a "land" rather than a single furrow; and the word is dialectic and poetical, anyway.

So it would seem that there is some slight justification for *notaulus,* none at all for *notaulix;* but that if we were to become absolute purists in such matters we should probably have had to inuse "notaulōn" (plural notaulōnes).

Fortunately there is not yet a code of rules in the matter, and we can peacefully go on following Morley's use, unchallenged for thirty years: *notaulus.*

We might mention in appendix two other cases where recent attempts to purify our usage have not come off quite perfectly. There is the family of beetles whose type genus is *Cupes.* Traditionally we called them the Cupesidae. Not so long since, Tillyard was emphatic that they should be the "Cupidae." But a moment in a Latin dictionary shows that *cupes* (more often spelt with two *p*'s) is merely the regular word for "pretty"; its genitive is *cupedis,* and the family should of course be Cupedidae.

Then there is the dragon-fly, *Agrion.* Again we have no record of its derivation. We have derivatives formed on the stem *Agrion-* since Leach in 1815, and Selys in 1831 proposed the corresponding Latinized singular, *Agrio.* But recently people have begun saying we should write "Agriidae." This assumes the origin was from the Greek neuter, ἄγριον a wild thing. Fabricius himself treats it as feminine (*ciliata, nobilitata*); but the most plausible derivation seems to me from the present participle of ἀγριόω, contracted ἀγριῶ, ἀγριῶν "one who is hunting." This is masculine, but I suspect is what Fabricius had in mind; if so the purists should write: "Agriuntidae."

DESCRIPTIONS OF SOME NEW MACROLEPIDOPTERA FROM EASTERN AMERICA.

By A. E. Brower, Augusta, Maine.

Lycaena dorcas claytoni new race.

Typical *dorcas* comes from central Canada, probably from the vicinity of Cumberland House, Manitoba according to a recent letter from Dr. J. McDunnough. The species has not been recorded from the New England region though I have collected it in two areas and probably seen it in another.

Compared with *Lycaena dorcas dorcas* Kirby Maine specimens are smaller, much darker, and duller purplish red with a reduction in the size and number of the spots especially above. Male: Upper surface, often with only the discal spot and two more nearer the base, though the extra discal row is generally more or less complete, with marginal band narrower; secondaries, darker, with fewer smaller spots and anal orange marking usually faint; undersurface, spots much smaller, tending to disappear on the hind wings; submarginal crenulate orange band much fainter; ground color more orange, lacking most of the violettish scaling which on *dorcas dorcas* is especially heavy toward the outer margin.

Female: this sex varies so much in *dorcas dorcas* that comparison is difficult; *claytoni* averages much darker purplish black in color with rarely any areas of clear deep orange scaling on the upperside; the spots are reduced in size both above and below; the underside is brighter orange because of less violettish scaling.

Expanse: Male, 24–26 mm.; female, 25–28 mm.

Type locality: Springfield, Maine.

Types: Holotype male and allotype female, Springfield, Maine, July 27, 1938, A. E. Brower; paratypes, sixty males and fifty females all in Springfield and Lee, Maine, July 27–August 5, 1937 and 1938. The holotype and allotype will be placed in the U. S. National Museum, also paratypes there and in other collections.

This race is named for Walter J. Clayton, one of Maine's able field naturalists.

Catocala connubialis form **pulverulenta** new form.

This form is characterized by its uniform powdery, greenish, blue-gray primaries, the characteristic contrasting maculation of usual *connubialis* being absent. The transverse anterior line is evident on the costa but usually becomes lost. The transverse posterior line is evident but faint, and it is bordered outwardly by a slightly browner shade, which becomes fairly prominent on some specimens. The darker outline of the reniform is generally discernible, and some specimens have a dark patch above it. The marginal dark marks are prominent. Secondaries normal.

Type locality: New Jersey.

Types: Holotype male; Green Village, N. J., July 5, Charles Rummel; allotype female, Great Notch, N. J.; paratypes, fourteen males and one female, Orange Mts., Millburn, Great Notch, and Livingston, N. J., July 10 to 24; one male, Creedmoor, Long Island, N. Y., July 10, two males, Lincoln Co., Ark., June 10 and 15.

The holotype and part of the paratypes will be deposited in the U. S. National Museum.

Thera procteri n. sp.

Head, thorax, and abdomen ashy gray; primaries somewhat lighter ashy gray with prominent darker irregular median band and somewhat less prominent basal area both shaded with brown; transverse anterior line vertical to the cell, sharply toothed (varying to short blunt teeth) outward in the cell and less so in the fold, bowed inward to inner margin. The median band has the position and general shape of that on *Thera georgii* Hulst and *otisi* Dyar, but the bounding lines are much more irregular and strongly round-toothed and tend to connect by a blackish bar in the cell which may greatly constrict the band; median line nearly vertical to the cell then sharply and strongly toothed outwardly in the cell toward a less prominent inbowing of the transverse posterior line; transverse posterior line very irregular with prominent rounded teeth, strongly angulated outward opposite the cell; a black dash below apex; outer margin narrowly margined with black; outer half of fringe blackish. Secondaries light smoky gray, with a dark strongly bowed postmedian line. The sexes are similar, the males have more fuscous scales, and the basal area and other markings are more prominent on the females.

Expanse: Male, from 21–26 mm., averaging 24.5 mm.; female from 22–25 mm., averaging 24 mm.

Type locality: Mount Desert Island, Maine.

Types: Holotype male, Bar Harbor, Maine, October 16, 1938. A. E. Brower; allotype female, Bar Harbor, Maine, October 18, 1938. A. E. Brower; paratypes, twenty-five males and thirty-five females, same data except other dates in 1937 and 1938. The types and part of the paratypes will be deposited in the U. S. National Museum, other paratypes will go to the American Museum of Natural History, Museum of Comparative Zoology, New England Museum of Natural History, and the Canadian National Collection.

Thera procteri is apparently a rare species as I have been unable to find it in the large eastern collections. Rubbed specimens might be easily confused with *Thera contracta* Packard but the lines bounding the median band are very irregular and strongly toothed on *procteri* and on *contracta* even or slightly toothed, though they are usually angulate, The genitalia are distinct.

Named for Dr. Procter, the most active collector of the fauna of Mount Desert Island.

Mischocyttarus cubensis var. mexicanus, Another Stowaway in Bananas.—A collection of Texas wasps, recently sent for identification by Dr. H. J. Reinhard, of the Texas Agricultural Experiment Station, contained two females of the Polybiine social wasp, *Mischocyttarus cubensis* var. *mexicanus* (de Saussure). They were collected by Mr. Hugh S. Cavitt, who kindly informs me that the nest and wasps were found in a bunch of bananas in a grocery store at Holland, Bell Co., Texas. Bunches of bananas appear to be unusually well adapted to the transport of social wasps into new territory, particularly of *Mischocyttarus,* whose nests are often small and inconspicuous. The accidental introduction into the United States of two other species of this genus has been reported in this Bulletin (1937, XXXII, p. 116). *M. cubensis* var. *mexicanus* is known from Costa Rica, the Republic of Honduras, Guatemala and Mexico (States of Sonora, Colima, Tamaulipas, etc.). It was discussed at length in my revision of Nearctic Polybiinae (1933, Entomologica Americana, N.S., XIII, p. 142). The identification of the Texas specimens was confirmed by Mr. O. W. Richards, who is now writing a monograph of the genus.—J. Bequaert, Harvard University Medical School, Boston, Mass.

NEW FORMS AND SPECIES OF THE GENUS CATASTICTA—III.

By F. Martin Brown and F. W. Goodson.

This paper describes material principally from the Zoological Museum, Tring, Herts, England. Mr. Goodson is responsible for having recognized the forms as being unnamed. Mr. Brown has made the necessary comparisons, written the descriptions and is responsible for any errors.

Catasticta philomene punctata form **obsoleta,** n. form.

Male—Upperside: This surface resembles that of *punctata* with further reduction of the discal area on both wings. The limbal series is so reduced as to escape notice. The light scales of the discal area of the hindwings are light orange.

Underside: On this surface are found the chief characters of the form. The forewings are as in *punctata* with all the light maculations reduced in extent. On the hindwings the limbal zone reaches the origins of the upper radial and the first branch of the median nervules. The basal dark zone almost reaches the limbal zone, thereby reducing the discal area to a minimum. The marginal and the limbal series are pinkish-orange and very small. The submarginal pearly areas are reduced to a few scales in each interspace. The discal stripes are pinkish-orange and posterior to the cell are surrounded by only a few lines of shining white scales; anterior to the cell there is a little broader line of white separating these from the broadly marked dark nervules. The area between the costa and the precosta is almost filled with orange scales and contains very little white.

Type localities and repositories of the types:

Holytype: male, Limbani, Carabaya, Peru, 9500 feet, May 1904, dry season.

Paratype: male 1, Limbani, Carabaya, Peru, 10,000 feet, Nov. 1901, wet season.

Paratype: males 2 & 3, Oconeque to Agualani, Carabaya, Peru, 6–9000 feet, March 1905.

All the types are in the Zoological Museum, Tring, England.

Catasticta fulva **kentae,** n. subsp.

Upperside: This is similar to that of *fulva,* but is totally lacking in the suffusion of dark scales on the disc and over the limbal series of spots. The basal dark area of the forewing is a little smaller, therefore the discal band is broader than the limbal band and there is a large patch of orange in the cell.

The basal dark area of the hindwings is also slightly reduced and, since the disc lacks any suffusion, it is clearly defined. The lack of suffusion makes the limbal and the marginal series of spots on these wings more prominent than on *fulva.*

Underside: This is identical with that of *fulva;* in some specimens there is a slight orange cast over the hindwings.

Average length of costal margin of the forewing: 23 mm.

Type localities and repositories of the types:

Holotype: a male, Rio Huayabamba, S. E. of Chachapoyas, Amazonas, Perú, 3500 feet, in the Zoological Museum at Tring, England.

Paratypes: 6 males, same data and same place as type.
2 males, Chachapoyas, Peru, in British Museum.
7 males, near Rioja, San Martín, 900 m., Peru, Oct. 27, '36–Nov. 14, '36, coll. F. M. B.
12 males, Almirante, Amazonas, Perú, 1900 m., Dec. 15, '36–Dec. 29, '36, coll. F. M. B.
3 males, Rio Seco near Rioja, San Martín, Perú, 900 m., Sept. 8, '36–Sept. 21, '36, coll. F. M. B.
3 males, Guayabamba, Amazonas, Perú, 1300 m., Aug. 16–Aug. 19, '36, coll. F. M. B.
1 male, "Bolivia," Paris Museum.

Named for Miss Nadine Kent who spent two years of painstaking time making the colored plates for my revision of the genus.

Catasticta scaeva **restricta,** n. subsp.

Upperside: Like *scaeva,* but with narrow discal bands and a distinct spot in the end of the cell of the forewing. On the hindwing the limbal band reaches either or both the origins of the M_1 and Cu_2 nervules. The limbal and marginal series are a little more distinct and there is a marginal series of streaks on the forewing.

Underside: The most important difference is the more acutely triangular form of the marginal series on the hindwing. Curiously the cell spot on the forewing is smaller and often bipartite.

Average length of the costal margin of the forewing: 22 mm.

Type: a male, Chaco, Bolivia, in the Zoological Museum, Tring, England.

Paratypes: 2 males same data and place as type.

4 males same data as type in Zoological Museum, University of Berlin, Germany.

Herman G. Erb, a former member of our Society, died on March 12, 1940, at his home in Ozone Park, N. Y. Mr. Erb was past 70 years. He was an assiduous collector of macrolepidoptera, did a great deal of breeding and exchanged and sold specimens in this country, as well as abroad. While not of a scientific mind, he assembled a large collection of both domestic and foreign lepidoptera. His chief interests were Papilios, Catocalas and Noctuidae, many of the latter collected at Bear Mountain, N. Y., where he officiated as chef in the refectory of the park.

The Erb collection, we understand, will be for sale. Inquiries should be addressed to 94–25–97th St., Ozone Park, N. Y.

A List of Michigan Diptera.—The undersigned and Mr. Curtis W. Sabrosky, of Michigan State College, East Lansing, Mich., are preparing a List of the Diptera of Michigan which now includes 2000 species. We are desirous of making the list as complete as possible, both as regards accuracy of determinations, number of species included and extent of distributional data. Correspondence is earnestly solicited with any who have specimens or records of Michigan Diptera. Full acknowledgment of any assistance will be given in publication.—GEO. STEYSKAL, 23341 Puritan Ave., Detroit, Mich.

BOOK NOTES.

Meadow and Pasture Insects, by Herbert Osborn. Pp. i–viii + 1–288, figures 1–103. (The Educators' Press, Columbus, Ohio; $3.75.)

This latest book by Dr. Osborn brings together his ripe observations and conclusions on the vast assemblage of insect forms that overpopulate our meadows and grasslands. It is, in essence, a far-reaching and compendious study of all the organisms that depend in a greater or less degree on grasses, from man down the line to the lowly earthworm. The stress, as the title indicates, is on insects proper and on their interference with the needs of man. The blackest pages—from a human point of view—are filled by the Homoptera, as is to be expected from a life-long student of that Order. But this is also natural, for any close collector in meadows and grasslands cannot but be struck by the superabundance of leafhoppers in comparison to all other groups of insects. In given places and under given conditions other Orders, particularly the Orthoptera, may dominate destructively; but everywhere the insidious leafhoppers are present, impairing growth and yield by their invisible and unnoticed feeding. In addition, these minute insects are known and suspected carriers of virus diseases of plants.

Of course, in a considerable part of the work, Dr. Osborn gives suggestions as to control of such meadow insects as are susceptible to various protective treatments; but equally of course, the only measures that really eliminate leafhoppers are direct, that is, either cultural, by crop rotation; or else the drastic one of burning over meadow lands, with all its attendant disadvantages.

As an intensive study of a specific ecological problem, this work stands pre-eminent. It is invaluable to the economic entomologist; equally so, the student of ecology must have it, not only because of the problem it sets forth so very concretely, but likewise for the treasures of biological data it contains. J. R. T.-B.

Entomological activity world-wide continues to grow and expand, especially—and naturally so—in its applied aspects. Here we note a few *new* journals received.

Devoted strictly to insects is **The Indian Journal of Entomology,** published by the Entomological Society of India at New Delhi (British India). The editorial staff is headed by Dr. Hem Singh Pruthi, and numbers such distinguished entomologists as Dr. Ramakrishna Ayyar, Dr. Chatterjee, Dr. Rahman, Dr. Lal and Dr. Mehta. The initial number, among its articles, contains a historical sketch by Dr. Ramakrishna Ayyar on "Entomology in

India"; and a number of others, biology being well represented. Of interest are the precise rules for authors, which have the unstinted approval of this editor. Noteworthy in this roster is the complete absence of British names.

The next journal comes from another far corner of the earth: **The Journal of the Entomological Society of Southern Africa,** published by the Society at Pretoria, Union of South Africa. The editor is Dr. T. J. Naudé; there does not seem to be an editorial board. The journal publishes (apparently) two volumes each year, in March and October. The two volumes before me are well-rounded in contents, no special emphasis being given to any one aspect of entomology.

From Mexico we have received two new biological journals, which deal of course with various aspects of entomology on occasion. One is **Revista del Instituto de Salubridad y Enfermedades Tropicales,** which is in charge of a publication committee, its members being Dr. Manuel Martínez Báez and Prof. Enrique Beltrán. Number 1, volume I, of this has three papers on insect vectors; one by Dr. Luis Mazzotti on *Trypanosoma cruzi* and two of its *Triatoma* (Reduviidae) carriers; and the other two articles on mosquitoes, by Dr. Luis Vargas.

The other journal is **Anales de la Escuela Nacional de Ciéncias Biológicas.** The publication committee is made up of Professors Leopoldo Ancona H. and Alfonso Dampf. Volume I, nos. 2 and 3, carries 3 articles on insects proper and two or three others on other arthropods, in general on their biological and medical aspects.

Both these journals are amply illustrated with half-tones and line cuts, many of the former photomicrographs. The format and typography are excellent, but deserve a much better quality of paper.

We mention here an older journal, now in its 44th year, the **Revista Chilena de Historia Natural,** edited for many years by Dr. Cárlos P. Porter. In view of its editor's predilection, there are always in this many articles on insects.

PROCEEDINGS OF THE SOCIETY.

MEETING OF APRIL 13, 1939.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, April 13, 1939, at 8:15 P.M. President William T. Davis presided, and nine other members were present, namely, Dr. Dietrich, and Messrs. Buchholz, Dietz, Engelhardt, Gaul, McElvare, Pechuman, Siepman and Stecher; also Dr. R. E. Blackwelder and Dr. A. Glenn Richards, Jr.

The minutes of the previous meeting were read and approved. Mr. Engelhardt reported as treasurer, stating that all of the Society's bills have been paid. He also read a letter from Mr. Torre-Bueno, stating that there was enough manuscript on hand to take care of the BULLETIN until October, but that there was, as usual, a need of short notes.

Mr. Engelhardt proposed for membership, Mr. Edwin Way Teal, 93 Park Avenue, Baldwin, Long Island, N. Y.

The by-laws were suspended, and Mr. Teal was duly elected a member.

Mr. Davis showed a copy of a recent book by Mr. Teal, "The Boy's Book of Insects," and also commented upon "Grass Root Jungles," an earlier book by the same author.

Mr. Gaul showed a box of beetles collected by Snyder in Korea; the lot, as a whole, looked very much like material that might have been collected in the northeastern United States. Many of the genera are identical with our own, but the species, of course, are not the same.

Various members commented upon the late season. Dr. Richards said that mosquitoes were reported three weeks behind time, based on larval determinations.

Mr. Buchholz said that he had obtained cocoons of an imported species of bagworn, *Fumis casta,* at Great Notch, N. J., from which he bred four adults of each sex. The female is remarkable for having a long ovipositor. Specimens were identified for him by Mr. Jones. The species was previously known from Massachusetts and Philadelphia.

Dr. A. Glenn Richards, Jr., addressed the society on the subject of "Insect Regeneration, or New Parts for Old."

Opening his talk with a reference to St. Denis, who, according to the legend, after being beheaded, tucked his head beneath his arm and walked away, Dr. Richards discussed the effect of decapitation upon insects. A bedbug, for instance, if beheaded, will continue to live for several years, its "expectancy of life" being in no way diminished. The silkworm moth, too, when decapitated, will continue to live as long as it normally would, which is about two weeks. The beheaded female will mate, lay eggs (though not quite as many are laid), and produced normal offspring. The headless male, on the other hand, loses interest in the opposite sex, probably because he normally is attracted by odors received by sensory organs located in the head, and which are now absent.

In Europe, experiments were made with hydrophilid beetles, in which heads were severed from the beetles and transplanted on other individuals. The heads, in some instances, would fuse to their new bodies, and from all outward appearances, the head was thoroughly welded to the body of the insect. Further investigation, however, showed that only the integuments fuse, and that the internal tubes and tissues do not make contact. Beetles with new heads are not capable of doing anything a decapitated insect cannot do.

The term death, as ordinarily used, has a dual connotation. It refers sometimes to the breakup of the coordinated system of reactions ordinarily associated with life, and sometimes to the disintegration or rotting of the individual cells that compose the body. In a decapitated insect, there is death of the first sort, associated with its habits. It can carry out various reflex and other actions induced by local stimuli, but it cannot act as a coordinated whole. Death of the second sort takes place at a later time, and in the case of insects, much later.

Regeneration of some sort takes place in all animals, though this power is present to a greater degree in animals lower in the scale, and in young animals. In human beings, the replacement of worn out cells, and of hair and finger nails, and the formation of scar tissue, are familiar forms of regeneration that take place throughout life. The replacement of parts not ordinarily lost, however, takes place only in the lower animals. A salamander, young or old, might replace a lost tail. The flatworm, *Planaria,* a simple organism whose chief anatomical features are a combination mouth and anus, and a pair of eye spots, is an interesting case. If cut in half, each half will grow the missing parts. If cut into smaller parts, each part grows a head and a tail. If a cut is made with two surfaces, a head or tail, as the case may be, grows on each surface.

If a living sponge is pushed through silk bolting cloth, virtually separating the animal into its individual cells, these cells seemingly grow together again, increase in size, grow new cells and organize into a recognizable sponge.

In insects, too, regeneration of lost parts is possible, and the literature on the subject is considerable. Thousands of cases are recorded, in almost all the orders except higher Hymenoptera and Diptera. The various parts reproduced include antennae, compound eyes, mouth parts, spiracles, imaginal wing discs, legs, cerci, caudal horns, larval gills, and bristles. In certain beetles the last segment or segments of the abdomen when cut from the larva, have been reproduced in the adult. There is only a single record of a beetle regenerating as many as three abdominal segments. Internal segments, as a rule, are not reproduced, except at the extreme ends of the animal.

The process of regeneration is briefly this: After the part is severed, the blood clots, although in some insects the blood neither clots nor discolors. Not until the next ecdysis, when the chitin is shed, does a segment of the missing part make its appearance. At the next molt, another segment is developed, until the normal number is reached. The segments may not be in perfect proportion, but they become more and more perfect in subsequent molts.

Not every insect that is mutilated will regenerate the missing part, and, as a matter of fact, in most cases nothing will happen at all. But in some cases, regeneration does take place, and various experiments have been made. Thus, in a caterpillar, a proleg and a pseudopod have been removed and transposed. With subsequent molts, the front leg changes to a thoracic leg, and the thoracic leg, in its new position, develops as it should, but is shed like an abdominal leg. If the first and third thoracic leg-rudiments are transposed in the larval stage, and the insect is successfully reared to maturity, the front leg and the hind leg will each be of normal size, but the antenna cleaner, instead of being on the front leg, as it should, will be on the hind leg.

Sometimes when parts are lost, normal regeneration of the lost part does not take place, but some other part grows in its stead, as, for instance, a leg in place of an antenna. An appendage or an organ is always replaced by one which is normally further back in the insect; never the reverse.

As an insect is confined in a shell that cannot stretch, no regeneration can take place in the adult, because it no longer sheds its skin. Silverfish, however, which continue to shed their skin after sexual maturity, can regenerate lost parts even in the adult stage.

Regeneration takes place only in tissues whose fate has not been entirely determined. In Diptera there is no regeneration because the parts of the body are determined at a very early stage, and if a portion is removed from the egg, that portion will be lacking in the adult.

The meeting adjourned at 10:10 P.M.

CARL GEO. SIEPMANN, *Secretary.*

MEETING OF MAY 11, 1939.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, May 11, 1939.

President William T. Davis called the meeting to order at 8:15 P.M. Eight other members were present, *viz.*, Dr. Dietrich and Messrs. Buchholz, Dietz, McElvare, Sheridan, Siepmann, Stecher and Teale; also Messrs. John J. Bowe and Ira Friedland.

Mr. Stecher exhibited a living tarantula spider, which he had reared for nine years. He feeds it upon beetles, grasshoppers, crickets and other insects, although cockroaches are preferred. The spider shed its skin about once a year, and Mr. Stecher kept a careful record of its moults. Discussion of poisonous spiders in general followed. Mr. Stecher said that the Black Widow Spider was quite common on Staten Island, if one knew where to look for them. One usually can find them under stones in fairly moist places.

Dr. Dietrich called attention to the fact that all the records of the Black Widow Spider from New York State are from either Long Island or Staten Island, and that there are none from "continental" New York.

Mr. Dietz showed a collection of *Saturnidae,* including all the species found in the United States. His material was excellently prepared. Mr. Bowe showed a specimen of *luna,* variety *rubromarginata,* and other lepidoptera of interest.

Mr. Davis spoke on "Cicadas from Colorado," of which he exhibited specimens.

The meeting adjourned at 9:45 P.M.

CARL GEO. SIEPMANN,
Secretary.

MEETING OF OCTOBER 19, 1939.

A regular meeting of the Brooklyn Entomological Society was held at the Brooklyn Museum on Thursday, October 19, 1939. President William T. Davis presided, calling the meeting to order at 8:15 P.M. Six other members were present, namely, Messrs. Buchholz, Dietz, Engelhardt, Gaul, Siepmann and Teale; also Messrs. John J. Bowe, John Elfstrom and Harold J. O'Byrne.

The minutes of the previous meeting were read and approved. Mr. Engelhardt, reporting as treasurer, stated that all current obligations have been met. He also reported for the publication committee, stating that the coming number of *Entomologica Americana* would consist of a synoptic table of the Hemiptera (except Miridae) by Mr. Torre-Bueno, which would be of great value as a reference book in colleges, etc. Enough material was on hand for the BULLETIN until next June, although there was still a need of short notes ranging in size from a few lines to one or two pages in length. Mr. Engelhardt also read a letter from Mr. Torre-Bueno.

Mr. Engelhardt reported the death of Dr. Walther Horn, of Germany, an honorary member of the Brooklyn Entomological Society, in his 68th year. A motion was made and accepted, that a note of sympathy be written, to which matter Mr. Engelhardt volunteered to attend.

Mr. Gaul showed a copy of a new book, "Contribution to the Biology of the North American Vespine Wasps," by Dr. Carl D. Duncan, which treats of the anatomy and social life of these insects. Mr. Gaul said he had collected in Connecticut during the past summer. He isolated 56 species of bacteria from the interiors of wasps, and prepared 200 slides with protozoa from the same source. Chalcid flies were obtained from two species, and he showed a vial containing numerous living specimens of *Mellittobia chalybii* which were bred from Vespides. He also showed a freak specimen of *Dolichovespula maculata,* in which the wings were reduced to mere stubs.

Mr. Teale spoke of his experiments in photographing bumblebees on hollyhock flowers and identifying individual specimens by marking them with paint. On several nights the same individual would return to the same flower, and assume exactly the same position in the flower as on previous nights. Mr. Teale also found that bees would sting him when he wore a black shirt, although at other times they would not molest him. That bees are thus adverse to black, is not, however, a new discovery. Mr. Davis added that horse flies, on the other hand, are attracted to black, and a black umbrella in a field will attract horse flies in numbers.

Mr. John Bowe showed a specimen of *Thecla m-album,* which he captured in Van Cortland Park. This species is only occasionally taken in the vicinity of New York City.

Mr. Buchholz exhibited an unusual *Colias,* which combines a species and its aberration, and two sexes in one specimen. The left is a yellow male *Colias philodice,* the right a female albinic form. He also showed a series of *Papilio troilus* from New York, Virginia, North Carolina and South Carolina, which gradually increased in size and merged into typical *texanus,* which were represented by Florida specimens. Mr. Buchholz collected during the past season in Wilmington, N. C., and the Dismal Swamp, and showed excellently prepared specimens from this region.

Mr. Dietz reported that last summer's collecting in the Bronx was very poor. The continued dry weather probably had an effect on the larvae. Even *Pieris rapae,* the cabbage butterfly, was much scarcer than usual. He showed a series of *Catocala meskei,* which he collected. Mr. Dietz knows a spot in the Bronx where he can get them every year.

Mr. Engelhardt said that he spent most of the summer in Washington, and didn't do much collecting. He spoke of his method of preserving lepidopterous larvae. He puts them in hot water and lets them come to a boil, before putting them in alcohol. Specimens so boiled don't discolor nor do they shrink, as would specimens put directly into alcohol. He also spoke of the *Ampelopsis* borer, a clearwing moth which he found breeding in Boston Ivy in his own back yard. Although this species was described by Harris about a century ago, only a dozen or so specimens are in collections.

Mr. Davis showed specimens of Cicadas from the Cayman Islands, south of Cuba, which were described in his paper in the Journal of the New York Entomological Society for September, 1939. Three closely allied species of *Diceroprocta* occur on the three Cayman Islands. In *D. cleavesi* from Grand Cayman Island, the sexes differ in color, the male having broad pruinose areas at the sides of the abdomen, whereas the pruinose areas are narrow and inconspicuous in the female. At Little Cayman Island, 60 miles away, occurs *Diceroprocta caymanensis,* in which both sexes have inconspicuous pruinose margins, much as in the female of *cleavesi.* At Cayman Brac, only six miles from Little Cayman, the species *Diceroprocta ovata* occurs, in which both sexes have the broad pruinose margins, much as in the male of *cleavesi.* In addition to the sexual differences, structural characters indicate that the three forms represent distinct species.

Mr. Davis said that the wing venation was nearly similar in all Cicadas the world over; only an occasional species like *Polyneura* from India, has unusual venation.

Mr. Gaul spoke of butterflies and other insects preserved by imbedding them in transparent plastic blocks. Such mounts are unbreakable, safe from dermestids, and can be viewed from all sides.

The meeting adjourned at 9:45 P.M.

Carl Geo. Siepmann,
Secretary.

EXCHANGES

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

Old notices will be discontinued as space for new ones is needed.

DIURNAL LEPIDOPTERA.—Have many desirable western species to exchange, including *Argynnis atossa, macaria, mormonia, malcolmi, nokomis; Melitaea neumoegeni; Lycaena speciosa;* etc. Send lists. Dr. John A. Comstock, Los Angeles Museum, Exposition Park, Los Angeles, Calif.

BUY OR EXCHANGE: Pinned Microlepidoptera and papered Pieridae of North America. Full data with all specimens. Named material of all groups offered. Alexander B. Klots, College of the City of New York, New York City.

EXCHANGE OR FOR SALE.—*Catocala herodias* (Gerhardi), *Graptolitha viridipallens* and others. Wanted: Rare N. A. Macro-Lepidoptera. F. Lemmer, Lakehurst, N. J.

WANTED.—North American CHRYSIDIDAE for exchange or determination, with privilege of retaining duplicates. W. G. Bodenstein, Dept. Entomology, Cornell University, Ithaca, New York.

PENTATOMIDAE: Want to buy or exchange Petatomidae from the United States and Mexico. Herbert Ruckes, College of the City of New York, 17 Lexington Ave. N.Y.C.

ACALYPTRATE DIPTERA OF THE WORLD wanted for determination or in exchange for other insects. Geo. Steyskal, 23341 Puritan Ave., Detroit, Mich.

LOCALITY LABELS.—3½ or 4 point type; 40c per five hundred, 60c per thousand, 40c for each additional thousand, same type. Type labels on colored paper 10c extra. Good paper, clean work, no trimming. The Nature Co., Box 388, Lawrence, Kansas.

LEPIDOPTERA COLLECTION.—Excellent condition, fine representation of named N. A. Diurnals and Nocturnals. Apply to Hy. J. Dietz, 3153 Decatur Ave., New York, N. Y.

Vol. XXXV DECEMBER, 1940 No. 5

BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

NEW SERIES

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JAN 3 1941
NATIONAL MUSEUM

PUBLICATION COMMITTEE
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CARL GEO. SIEPMANN GEO. P. ENGELHARDT

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The Brooklyn Entomological Society

Meetings are held on the second Thursday after the first Tuesday of each month from October to June, inclusive, at the Central Museum, Eastern Parkway and Washington Ave., Brooklyn. The annual dues are $2.00.

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BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XXXV December, 1940 No. 5

A NEW SPECIES OF RHYACOPHILA, DESCRIBED FROM METAMORPHOTYPES (RHYACOPHILIDAE; TRICHOPTERA).

By Margery J. Milne and Lorus J. Milne, Randolph-Macon Woman's College, Lynchburg, Virginia.

When the metamorphotype method was first proposed, mention was made of several advantages peculiar to it (M. Milne, 1939). A further point in its favor has become apparent recently while studying metamorphotypes of the genus *Rhyacophila* (Rhyacophilidae).

In *Rhyacophila,* fifty-seven species are recognized from America north of Mexico. A key to the adults of the forty-six known prior to 1936, a synonymic list and illustrations of the genitalia of both sexes (where known) were published by L. Milne (1936). Eleven species have been described since that time (H. H. Ross, 1938, 1939; S. Ling, 1938). Of the fifty-seven, twenty-four are known from males only, twenty-eight have had females associated with males by various means (some questionable), three species were described from the female alone and have not since had males associated (*R. formosa* Bks., *R. mainensis* Bks., and *R. nigrita* Bks.), and eight species of females were illustrated by L. Milne (*op. cit.*) but not named since associated males were lacking. The six Ling species are unrecognizable from their descriptions, and illustrations for them were not published.

Male genitalia in *Rhyacophila* have many excellent specific characters but a large proportion of the species have female genitalia which end in a squarely truncate terminal segment which is apparently devoid of features useful in segregation. Unassociated females having this type of abdominal apex are not identifiable at present. Females not definitely associated with males are also a problem, even though their genitalia have good specific characters. A means of establishing relationships between male and female of the same species was needed. Metamorphotypes fill this need,

JAN 2 1941

since the numerous and strong larval and pupal characters are specific and not secondary sexual features. Thus among mixed metamorphotypes of different species and both sexes, there is no difficulty in separating species irrespective of sex by the larval and pupal characters. Males and females which have these larval and pupal characters the same belong to the same species. This is an association in which the form of the adult genitalia is of no consequence, but it is the needed means of establishing this relationship.

One such group of metamorphotypes having larval and pupal characters identical appears to be an unknown species of *Rhyacophila.* We are naming it **Rhyacophila bruesi** n. sp. in honor of Professor C. T. Brues of Harvard University, who has been most generous of caddis worms and pupae collected on his several summer trips. The new species is represented by two larvae, three male and five female pupae from near Jasper National Park, Alta., Canada, Aug. 15, 1936 (Brues). In addition, we have four larvae and two male pupae from Camp Creek, Mt. Hood National Forest, Oregon, Aug. 2, 1933 (Dimick). A male pupa with its associated sclerites is metamorphotype No. 117, holotype of the species, illustrated herewith. A female pupa is No. 118, the allotype, of which the genitalia are illustrated. A second male and a second female pupa (Nos. 115, 116) and a larva are being deposited in the Museum of Comparative Zoology, Cambridge, Mass. All of these are from the Alberta locality. The other pupae are paratypes, and like the holo- and allotype and larvae, are for the present in the Milne collection.

Pupa: Labrum slightly sclerotized, mandibles strongly sclerotized and serrate; face and vertex with a few long, slender, dark hairs. Pronotal warts and anterior edge of mesonotum with similar dark hairs; intermediate tarsi strongly fringed; spurs 3–4–4. Abdominal sclerites minute; apex membranous, conforming to genitalia; a few short, fine, dark hairs on sternites; gills absent. Length 10 mm., width 2.5 mm.; antennae almost as long as body.

Male: the genitalia, as illustrated, show that this species is closely related to *R. vaccua* Milne (1936) and *R. iranda* Ross (1938).

Female: the genitalia, as illustrated, are different from those of females known hitherto, and show greatest similarity to the type found in *R. vaccua* Milne.

Pupal shelter: Case an elongate, oven-shaped structure, of medium to large sized pebbles irregularly attached; floor of silk only; inner cocoon complete.

Larva: Labrum, frons, epicranium, most of pronotum and legs, clear yellow. Mandibles, gula and labium, edges and hind lobes of pronotum, and pleura, blackish brown. Head shallow, flat above. Pronotum longer than broad, the posterior lobes well developed, with several ridges. Two long, strong, dark bristles each side on abdominal terga; prolegs yellowish with dark brown markings, the basal segment with one to three long, dark hairs, the claw with a single spine below; gills absent. Length 15 mm., width 2.5 mm.

Illustrations: All structures are shown from dorsal view, except the following: gula, labium and maxilla, left half of each divided genitalic drawing, these all from ventral view; proepimeral spine and proleg claw from right lateral view. The pupal labrum and mandibles were drawn to the larval scale (as shown by line indicating similar magnification of one mm.), the other pupal structures to the scale shown by similar enlargement of one half mm.

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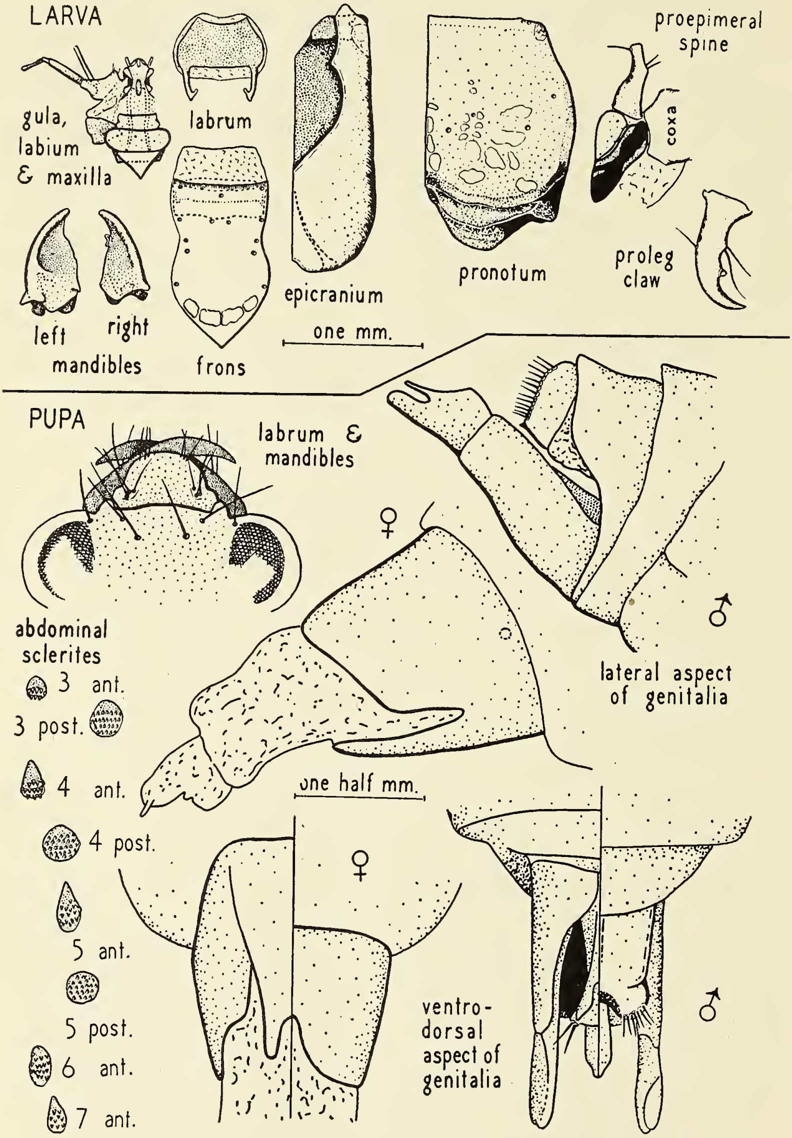
Black-flies bite woodchuck.—On June 5, 1940, a warm, quiet, sunny day, the writer, in company with C. P. Vinal, shot a woodchuck at Westboro, Massachusetts. While the animal was being examined for ectoparasites, several black-flies were observed on the skin of the abdominal wall sucking blood. Two of these flies were determined by Dr. J. C. Bequaert as *Simulium parnassum* Malloch. Mr. Vinal informs me that on numerous occasions he has observed similar flies biting woodchucks shot in Westboro. This is the first record of such an occurrence, and it provides additional information on the feeding habits of black-flies on wild animals, concerning which there is as yet little known—H. S. FULLER, Department of Comparative Pathology and Tropical Medicine, Harvard Medical School, Boston.

Plate I.


LARVA
gula, labium & maxilla
labrum
epicranium
pronotum
proepimeral spine
coxa
proleg claw
left
right
mandibles
frons
one mm.
PUPA
labrum & mandibles
♀
♂
lateral aspect of genitalia
abdominal sclerites
3 ant.
3 post.
4 ant.
4 post.
5 ant.
5 post.
6 ant.
7 ant.
one half mm.
♀
ventro-dorsal aspect of genitalia
♂

BIOLOGICAL NOTES ON ARIZONA HETEROPTERA.

By J. R. de la Torre-Bueno, Tucson, Ariz.

The data following are culled from my field notes from September 1934 to June 1940. They include hibernation data, altitudes, food plants, etc., details to be worked eventually into a general picture. They are given for what they are—observations on the field.

Belonochilus numenius Say, a common denizen of sycamore in the East (*Platanus occidentalis*) and in the West (*Platanus racemosa*). This was taken at Tanque Verde (elevation about 3000 feet) on February 17; and again on the 19th at Madera (or White House) Canyon (elevation about 5000 feet) on the West slope of the Santa Rita Range. In both instances the bugs were hiding under loose bark, and quite active; and the trees were growing by running water. At Madera Canyon, at the same time, one *Crophius schwarzi* Van Duzee was found. Also, under dead sycamore bark at Tanque Verde was found abundance of *Mezira emarginata* Usinger.

Atriplex sp. in vacant lots in Tucson harbors abundance of *Thyanta rugulosa* Say and *T. brevis* Van Duzee from the first days of August on.

Lyageus circumlitus Stål came to light between June 16 and 23. A new record for Arizona (and apparently for the United States) is *Lygaeus trux* Stål, a Mexican species, one specimen being taken in Sabino Canyon, Santa Catalina Range and another in the foothills of the Santa Ritas, both at about 3500 to 4000 feet, on October 21 and November 2 respectively.

Corimelaena extensa Uhler is to be found throughout the summer in great numbers on tree tobacco (*Nicotiana glauca*). Commonly it gathers in small groups at the axils of the leaves, or else in twos and threes head down, in the seed capsules.

The tiny neidid *Pronotacantha annulata* Uhler is far from rare in Tucson during May. I have found it commonly on yellow columbine (*Aquilegia*) in my garden. Cultivated snapdragon (*Antirrhinum*) in gardens is a favorite harborage. It is most frequently found on the flowers, under the lip of the hood, adults in copulo and nymphs as well.

At Madera (White House) Canyon, the tingid *Teleonemia nigrina* Champion was found in great numbers on August 13, on the under side of the leaves of wild verbena. It was so abundant as to bleach the plant.

ADDITIONAL SPECIMENS OF LASIA PURPURATA (ACROCERIDAE).

By Geo. Steyskal, Detroit, Mich.

Among material loaned by K. C. Emerson of the Oklahoma Agricultural Experiment Station were two males of *Lasia purpurata,* described by J. Bequaert (1933, Amer. Mus. Novitates No. 617) from a single male taken in "Latimer Co., Oklahoma." Inasmuch as most species of this genus are known from but one or two specimens additional material is always of value. The specimens at hand have the following data: Wilburton (Latimer Co.), Okla., June 9, 1934 (A. E. Pritchard), and Page (Le Flore Co.), Okla., June 23, 1937 (Standish-Kaiser). Page is about 45 miles east of Wilburton.

The specimens appear identical except certain features of the wing venation, the shape of the antennae and a small difference in the length of the proboscis. The Wilburton specimen agrees closely with the description of *purpurata,* except that the third vein branches closer to the small cross-vein, this part of the wing being much as figured for *L. yucatanensis* (Amer. Mus. Novitates No. 455, p. 7, f. 1B). The Page specimen has the third antennal joint more strongly tapering (as figured for *L. klettii,* l.c., f. 1E) and the third vein branches exactly at the small cross-vein, the wing being as in Osten-Sacken's figure of *L. klettii,* but lacking the abnormal branches of the third and fourth veins. In both specimens the puncturation of the middle of the first and second tergites is scarcely so crowded that "the intervening spaces are narrower than the punctures." Although the specimens are in generally excellent condition, the elevated frontal triangle is a little sunken and the labrum a little wrinkled transversely. The length of body and wing differ negligibly from those of the type of *purpurata,* but the proboscides are 20 and 18 mm. long respectively (measured from tip of labrum).

The writer believes that *L. purpurata* is most closely related to *L. klettii* Osten-Sacken.

To Subscribers.—Prompt renewal of subscriptions will be appreciated by The Editor.

TOLLIUS VANDUZEEI N. SP., WITH NOTES ON THE GENERA TOLLIUS STÅL AND STACHYOCNEMUS STÅL (HETEROPTERA, ALYDIDAE).

By J. R. de la Torre-Bueno, Tucson, Arizona.

The American species of *Hyalymenus, Alydus* and *Megalotomus* on the one hand; and *Tollius* and *Stachyocnemus* on the other, form two compact and easily distinguished groups. Three of these genera are strictly American—*Hyalymenus, Tollius, Stachyocnemus;* the other two are Old World also—in fact, the type species of two, *Megalotomus* (*junceus* Scop.) and *Alydus* (*calcaratus* L.) are European.

In *Stachyocnemus* there has been presumably but one species, *apicalis* Stål. Fracker in his 1918 paper keys out the alydid genera, and in this monotypic genus characterizes a variety under the name *cinereus.* On the face of Fracker's figures and of the structural characters he mentions, this is obviously a distinct species, distinguishable from *apicalis* by the structure of the juga and the prominent basal tooth of the pronotum; and assuming the figure to be correct, also by the shape of the pronotum, the shape of the head, the size and position of the ocelli, the relatively shorter and stouter posterior femora, and a number of other characters which appear to be well-shown. It may therefore be known under the name of *Stachyocnemus cinereus* Fracker 1918.

Tollius has been considered to contain three species: *curtulus* Stål, the type; *setosus* Van Duzee (described in *Alydus*), and *quadratus* Van Duzee. To these is now added:

Tollius vanduzeei n. sp.

(*Alydus setosus* T.-B. 1913 Ent. News XXIV: 23; Fracker 1918 Ann. Ent. Soc. Am. XI: 274; nec Van Duzee 1906).

Head, including eyes, slightly broader than long (width, 35; length, 32 units),[1] ocelli very prominent, on high tubercles, as far from each other as from the eyes; proportion of antennal segments, from base to apex, 20:25:22:36 units; apex of rostral segment I not going beyond posterior margin of the eyes, proportions of segments, 15:20:7:15 units (*i.e.*, III shortest, I and IV equal); a pale median longitudinal stripe on head above and a pale curved lateral stripe below the eyes. *Pronotum* wider than long (length, 32 units; width, anterior, 27 units, posterior, 40), anterior angles and humeri rounded; a very short median anterior line, which has a small round indentation on each side at the posterior end; lateral pale stripe of the head continued for a short distance on the sides of the pronotum; below this stripe, a black oval smooth calloused area about as long as the stripe; upper surface with small dark punctures; posterior margin very narrowly reflexed, continued around the posterior margin of the humeri; a small median smooth elongate pale calloused transverse spot on the posterior margin; lateral margins narrowly calloused, black, more or less smooth; propleura with large pits, meso- and metapleura coarsely and irregularly pitted so as to appear in greater part coarsely rugulose; acetabula with broad smooth pale margins, with a few punctures; posterior femora armed to within one-quarter of their length from the base with a row of strong long curved spines; the other femora and all tibiae unarmed. *Scutellum* as long as wide (20:20), apex white, smooth, disc coarsely irregularly dark punctured. *Hemelytra* with irregular small punctures; membrane pale brown, exceeding abdomen, veins simple.

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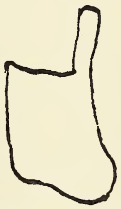
[1] Unit = .05 mm.

Abdomen beneath black with a thick recumbent gray pile and sparse long black hairs, segments IV, V and VI with a median more or less elongate white spot at or near the edge of the connexivum; other small vague reddish spots on the disc. *Male claspers* more or less quadrate, outer margin incurved, upper nearly straight, at the outer angle produced into an elongate blunt process, which is more or less outwardly inclined and about one-half the length of the body of the clasper; genital segment with extremely sparse pile, but fringed with long black hairs.

Head, pronotum and scutellum above, antennae, legs and venter with long sparse hairs. General color of upper surface a light brown, more or less variegated with darker.



Right male Clasper of *Tollius vanduzeei.* (Diagrammatic, much enlarged, not to scale.)

Type: male, Santa Monica, California, July 31, 1911 (J. M. Aldrich) in my collection. This is the specimen recorded by me (Ent. News XXIV: 23, 1913) as *Alydus setosus* Van Duzee; and later by Fracker (Ann. Ent. Soc. Am. XI: 274) as the same. It is named in remembrance of my good friend, the late E. P. Van Duzee, our great American hemipterologist.

This species conveys the impression in coloration of a smaller, more slender *Tollius curtulus.* It is readily distinguishable from this species by the form of the male claspers and by the antennal proportions. From *T. quadratus* Van Duzee it differs in the antennal proportions, the process on the outer angles of the quadrate male claspers and the length of rostral segment I.

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MORE AMBUSH BUG PREY RECORDS (HEMIPTERA).

By W. V. Balduf,* University of Illinois.

In the Canadian Entomologist for March, 1939, I presented a list of 81 species of insects taken from the grasp of our common ambush bug, *Phymata pennsylvanica americana* Melin in the vicinity of the University of Illinois in 1938, and described the feeding habits of this bug as observed in nature. During the summer and fall of 1939, I supplemented the above records with further observations in the field in the same area. These new records are offered here, with additional notes, in the belief that the complete picture the entomologist should eventually produce of insect bionomics can be obtained only by a series of observations made in the different parts of its range and under the varied ecological conditions imposed on them by successive years.

Records of the Two Years Compared. Excepting the Homoptera, which are represented in the list for 1938 by a single Cicadellid, the prey utilized by this phymatid in the two years belongs to identical orders. These are Coleoptera, Hymenoptera, Lepidop-

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* Contribution No. 213 from the Entomological Laboratories of the University of Illinois. I am pleased to acknowledge my indebtedness to Mr. C. F. W. Muesebeck and nine specialists of his staff at the United States National Museum for determining the species of prey insects reported in this article. My wife assisted very helpfully by mounting the prey specimens and transcribing the records.

Table I. Insect prey of Phymata

Systematic Position of Prey Taken			Specimens Captured	Inclusive Dates
Genus	Species	Family		
	Coleoptera			
Dectes	*spinosus* (Say)	Cerambycidae	2	VII–22
Diabrotica	*12-punctata* (Fabr.)	Chrysomelidae	7	VII–29: X–6
Diabrotica	*longicornis* Say	Chrysomelidae	6	VIII–16: IX–11
Smicronyx	(?*ovipennis* Lec.)	Curculionidae	1	VII–14
	Hymenoptera			
Bracon	*haematodes* (Brulle)	Braconidae	1	IX–22
Bassus	*simillimus* (Cr.)	Braconidae	1	VII–14
Bassus	*annulipes* (Cr.)	Braconidae	1	IX–5
Cardiochiles	*nigroclypeus* Vier.	Braconidae	1	IX–7
Microgaster	*facetosa* Weed	Braconidae	1	IX–7
Eurytoma	sp.	Eurytomidae	2	VII–8: VII–22
Apis	*mellifica* Linn.	Apidae	2	VII–14
Agapostemon	*virescens* (F.)	Andrenidae	1	IX–12
Halictus	*ligatus* Say	Andrenidae	5	IX–12: IX–25
Halictus	*provancheri* D. T.	Andrenidae	13	VIII–4: IX–22
Halictus	*pectoralis* F. Sm.	Andrenidae	1	IX–8
Halictus	*tegularis* Robt.	Andrenidae	1	VIII–4
Halictus	*versatus* Robt.	Andrenidae	3	IX–8: IX–15
Halictus	(*Chloralictus* spp.), males	Andrenidae	29	IX–9: X–16
Calliopsis	*andreniformis* F. Sm.	Andrenidae	3	VIII–4: IX–25
Paralictus	*simplex* Robt.	Andrenidae	2	IX–12: IX–19

TABLE 1.—(*Continued*)

Systematic Position of Prey Taken			Specimens Captured	Inclusive Dates
Genus	Species	Family		
	HYMENOPTERA.—(*Cont.*)			
Paralictus	*cephalotes* (D. T.)	Andrenidae	1	IX–23
Melissodes	*nivea* Robt.	Andrenidae	3	IX–7 : IX–8
Sphecodes	*levis* Lov. & Ckll.	Andrenidae	4	VII–29 : IX–22
Sphecodes	sp.	Andrenidae	1	IX–12
Coelioxys	*sayi* Robt.	Megachilidae	1	IX–18
Holcopasites	*illinoiensis* Robt.	Megachilidae	1	IX–19
Hylaeus	*ziziae* (Robt.)	Hylaeidae	1	IX–7
Odynerus	*anormis* Say	Vespidae	1	IX–8
Cerceris	sp.	Sphecidae	1	IX–22
Sphex	*placidus* (F. Sm.)	Sphecidae	1	IX–29
Psen	*cressoni* (Robt.)	Sphecidae	1	IX–25
	LEPIDOPTERA			
Pieris	*protodice* Bdv. & Lec.	Pieridae	3	IX–11 : IX–19
Colias	*eurytheme amphidusa* Bdv.	Pieridae	1	IX–11
Colias	*eurytheme eriphyle* Edw.	Pieridae	3	IX–23 : IX–25
Everes	*comyntas* (Godt.)	Lycaenidae	4	VII–22 : VIII–16
Phyciodes	*tharos* (Dru.)	Nymphalidae	1	VIII–16
Urbanus	*communis* (Grt.)	Hesperiidae	1	IX–15
Polites	*peckius* (Kirby)	Hesperiidae	2	VII–22 : VIII–4
Polites	*themistocles* (Latr.)	Hesperiidae	2	IX–11 : IX–12
Feltia	*subgothica* (Haw.)	Phalaenidae	3	IX–5 : IX–13

TABLE I.—(*Continued*)

Systematic Position of Prey Taken			Specimens Captured	Inclusive Dates
Genus	Species	Family		
	LEPIDOPTERA.—(*Cont.*)			
Agrotis	*gladiaria* Morr.	Phalaenidae	1	IX–25
Autographa	*brassicae* (Riley)	Phalaenidae	1	IX–20
Caenurgina	*crassiuscula* (Haw.)	Phalaenidae	1	IX–11
Cisseps	*fulvicollis* (Hbn.)	Amatidae	1	VII–29
Green caterpillar		Geometridae	1	September
	DIPTERA			
Eugnoriste	*occidentalis* Coq.	Mycetophilidae	4	VII–29: IX–11
Sciara	sp.	Mycetophilidae	1	IX–25
Empis	*clausa* Coq.	Empididae	15	IX–5: IX–9
Saltella	*scutellaris* (Fall.)	Sepsidae	1	IX–19
Zodion	sp.	Conopidae	1	IX–5
Occomyia	(possibly *loraria* Lw.)	Conopidae	18	IX–7: IX–15
Systoechus	*vulgaris* Lw.	Bombyliidae	1	IX–5
Sparnopolius	*brevirostris* Macq.	Bombyliidae	7	IX–5: IX–12
Desmometopia	*M-nigrum* Zett.	Agromyzidae	1	IX–11
Milichiella	sp.	Agromyzidae	1	IX–14
Sapromyza	sp.	Sapromyzidae	1	IX–9
Chloropisca	*glabra* (Mg.)	Chloropidae	1	IX–15
Oscinella	*coxendix* (Fitch)	Chloropidae	1	IX–15
Hippelates	sp.	Chloropidae	1	IX–11
?	?	Anthomyidae	1	IX–12
Limnophora	sp.	Anthomyidae	1	IX–20

Table 1.—(*Continued*)

Systematic Position of Prey Taken			Specimens Captured	Inclusive Dates
Genus	Species	Family		
	Diptera.—(*Cont.*)			
Hylemya	sp.	Anthomyidae	2	IX–18 : IX–22
Sarcophaga	*tenuiventris* V. d. W.	Sarcophagidae	1	IX–7
Sarcophaga	*lherminieri* R. D.	Sarcophagidae	2	IX–5 : IX–12
Sarcophaga	sp.	Sarcophagidae	1	IX–29
Senotainia	sp.	Sarcophagidae	1	IX–25
Cochliomyia	*macellaria* (F.)	Calliphoridae	1	IX–6
Lucilia	*illustris* (Mg.)	Calliphoridae	1	IX–12
Pollenia	*rudis* (F.)	Calliphoridae	1	VII–14
Stomoxys	*calcitrans* (L.)	Muscidae	2	IX–7 : IX–12
Musca	*domestica* L.	Muscidae	1	IX–7
Cistogaster	*immaculata* Macq.	Tachinidae	1	IX–15
Cylindromyia	?*fumipennis* (Walk.)	Tachinidae	2	IX–15 : IX–21
Cylindromyia	sp.	Tachinidae	1	IX–23
Leucostoma	*atra* Tns.	Tachinidae	3	VII–29 : IX–7
Siphona	*geniculata* DeG.	Tachinidae	1	IX–7
Hyalomya	*aldrichi* Tns.	Tachinidae	1	IX–5
Paradidyma	*singularis* Tns.	Tachinidae	2	IX–18 : IX–19
Gymnosoma	*immaculata* (Macq.)	Tachinidae	4	IX–8 : IX–22
Gymnosoma	*occidua* (Walk.)	Tachinidae	5	IX–8 : IX–22
Zenillia	sp.	Tachinidae	1	VIII–16
Cuphocera	sp.	Tachinidae	13	IX–5 : IX–22
Phorocera	sp.	Tachinidae	1	IX–13

TABLE 1.—(*Continued*)

Systematic Position of Prey Taken			Specimens Captured	Inclusive Dates
Genus	Species	Family		
	DIPTERA.—(*Cont.*)			
Plagiomima	sp.	Tachinidae	5	IX–7: IX–13
Limnaemyia	sp.	Tachinidae	2	VII–16: IX–14
Archytas	sp.	Tachinidae	1	IX–21
?	?	Tachinidae	4	VIII–16: IX–25
Eristalis	*meigenii* (Wd.)	Syrphidae	4	IX–5: IX–19
Eristalis	*tenax* (L.)	Syrphidae	12	IX–13: X–16
Eristalis	*aeneus* Scop.	Syrphidae	1	IX–8
Chrysogaster	*nitida* (Wied.)	Syrphidae	2	IX–8: IX–9
Mesogramma	*geminata* (Say)	Syrphidae	4	IX–11: X–6
Mesogramma	*polita* Say	Syrphidae	1	IX–22
Syritta	*pipiens* (L.)	Syrphidae	9	VII–14: IX–20
Platychirus	*hyperboreus* Will.	Syrphidae	1	IX–20
Sphaerophoria	*cylindrica* (Say)	Syrphidae	8	VIII–4: X–6
Baccha	*fascipennis* Wd.	Syrphidae	1	IX–6
Paragus	*bicolor* (Fab.)	Syrphidae	1	IX–18
Syrphus	*americanus* (Wd.)	Syrphidae	1	IX–7
Syrphus	sp.	Syrphidae	1	IX–20
Syrphus	sp.	Syrphidae	1	IX–15
	HEMIPTERA			
Adelphocoris	*rapidus* (Say)	Miridae	5	VII–29: IX–18
Lygus	*pratensis* (L.)	Miridae	2	IX–11
?	?	Pentatomidae	1	VIII–16

tera, Diptera and Hemiptera. The distribution by orders, of the prey taken, is summarized in Table 2.

TABLE 2. CHOICE OF PREY, BY ORDERS.

Order	1938			1939		
	Number of Species	Number of Specimens	Per Cent of Total	Number of Species	Number of Specimens	Per Cent of Total
Coleoptera . . .	6	55	22.0	4	16	5.44
Hymenoptera .	17	36	14.4	27	83	28.22
Lepidoptera . .	16	51	20.4	14	25	8.50
Diptera	33	83	33.2	56	162	55.09
Hemiptera . . .	8	24	9.6	3	8	2.72
Homoptera . .	1	1	0.4	0	0	0.00
Totals	81	250	100%	104	294	100%

The figures in the percentage columns show considerable differences in the proportionate prey value of the several orders in the two years. In the Coleoptera, the difference is due to the comparative scarcity, in the habitats investigated, of the three species of *Diabrotica,—duodecimpunctata, vittata* and *longicornis* in 1939. In 1938, the honey bee was the principal species of Hymenoptera taken as prey. However, the decline exhibited in it in 1939 was more than offset by the abundance, in both individuals and species, of its smaller andrenid relatives. In the order Lepidoptera, numerical decreases in 1939 in *Colias eurytheme, Phyciodes tharos* and *Feltia subgothica* are particularly striking. The number of Diptera secured in 1939 was double that in 1938. In the latter year, *Eugnoriste occidentalis, Archytas* sp. and *Pollenia rudis* ranked among the most common prey taken, but these flies are somewhat meagerly represented in the list for 1939. However, a greatly increased use was made of *Empis clausa, Syritta pipiens* and *Eristalis tenax* in 1939. Yet most of the addition in the fly order is explained by the advent of species not represented at all in the list for 1938. Especially noteworthy among these are the conopid, *Occomyia;* the bombyliid, *Sparnopolius brevirostris;* the tachnid, *Cuphocera* sp., and the syrphid, *Sphaerophoria cylindrica.* The decrease in number of Hemiptera in 1939 is clearly explained by the comparative scarcity of *Lygus pratensis* in the localities under investigation.

Feeding in Relation to Sex. In the two years, I took 443 insects that included notice of the sex of the ambush bug concerned as the predator. Of this number, 349 were found held by females and 94 had been caught by males. Thus, 78.8 per cent. or almost four-fifths of the total prey individuals were caught and killed by the female, and only 21.2 per cent by the male. That this disparity in rate of feeding is not traceable, to any significant degree, to numerical superiority of the females is shown by the ratio of sexes observed in 1939. Of 2611 adult individuals recorded, 1324 were females and 1287 males,—a difference of only 37 in favor of the females. The latter sex is therefore actually about four times more voracious than the somewhat smaller males. This quantitative discrepancy in food utilized is probably correlated with the rather large egg yield of the species. A larger amount of nutritious matter is required to produce eggs than is needed for spermatogenesis. During much of their productive periods, the females of a series observed in capitivity deposited an egg mass at about four-day intervals. These masses usually contained 12 to 20 eggs each.

In addition to capturing only about one-fifth as much prey as the females, the males secure captives that are, in general, smaller than those seized by their mates. The mycetophilids, *Eugnoriste* and *Sciara,* and the empidid fly, *Empis clausa,* are the smallest prey forms caught in greater numbers by this ambush bug. Of the 27 captured specimens of these small flies, 19 were found in the grasp of males. On the other hand, the males capture almost negligible numbers of the largest prey species, such as noctuid moths, skippers, pierid butterflies, the syrphid fly, *Eristalis tenax,* tachinids of the genus *Archytas,* and the honey bee. Of the 72 individuals of these larger forms collected, 70 were taken from the grasp of females, and only two, which were noctuids, were held by males. It is of interest also that the two largest and strongest Hymenoptera captured were secured by females. One was a male of the parasitic bumble bee, *Psithyrus variabilis,* the other a *Sphex placidus.* In 1939 the latter species was common in the ambush bug habitats. The capture of these Hymenoptera, even by the females, was made possible only by the low atmospheric temperatures prevailing on the dates of capture.

Of the above 349 females found feeding, 250 were single, 93 coupled with males,—*i.e.,* males riding on the backs of their mates, and three were in the copulatory position. Of the 94 feeding males, 78 were single, 16 coupled with females, and none in copulation.

Other feeding combinations are noteworthy. Both the males and females of seven couples fed simultaneously on a single captive insect, probably usually captured by the females. In one instance, two single females were engaged concurrently in sucking out the contents of a 12-spotted *Diabrotica.* Again, two coupled females fed at the same time on a moth (*Autographa brassicae*). Incidentally, this is the only time two females have been seen to date in that posture and it was perhaps purely incidental to the preying process.

In another instance, the females of two coupled pairs shared a skipper (*Polites peckius*), and in still another kind of combination, the male and female of a coupled pair had each captured a prey specimen and was found feeding on its own catch. In two instances of the latter type, the females held noctuid moths, while the males had secured flies. In another kind of relation, an ambush bug and an adult assassin bug (*Sinea diadema*) were seen, on two occasions, feeding simultaneously on one insect. A tachinid fly (*Gymnosoma*) and a syrphid (*Eristalis tenax*) were the prey species involved.

Miscellaneous. Observations made in 1939 on the ambushing habits and the killing, feeding and discarding processes of *Phymata* entirely confirm the statements made in my earlier paper (1939). In each year, all prey specimens obtained were winged adults, excepting a nabid nymph, taken in 1938, and a small slender geometrid larva and a pentatomid nymph, taken in 1939. Some insects present in the *Phymata* habitats again regularly or almost always escaped capture. Most noteworthy are the soldier beetle, *Chauliognathus pennsylvanicus* and the slender-waisted wasp, *Sphex placidus,* which were abundant and common, respectively. Additional ambush plants noted are fever few (*Parthenium integrifolium*) and *Kuhnia eupatorioides.* The first is not plentiful, and ambush bugs occurred on it infrequently, but as many as 20 bugs were seen on each of several days on a single bushy individual of *Kuhnia* at the peak of its blooming period. The flowers of both these plants are greyish green. The principal ambush plants in the habitats visited were a species of *Bidens* with conspicuous yellowish-orange rays, and the abundant small-flowered, white-rayed late-blooming aster, *Aster multiflorus.* As in 1938, several adult ambush bugs were discovered probing the heads of Compositae with their beaks as if seeking to obtain nectar.

Diptera constituted the prey taken in most consistently high numbers. While forming a large part of the total captives, andrenid bees exhibited conspicuous numerical variation, particularly on September 12, 13 and 14. Of the 39 prey specimens collected on the twelfth, 19 were andrenid bees but, for reasons still unknown, no bees of any kind were in possession of the bugs in the same place on the thirteenth, and only two such were obtained on September 14. Yet a good number of flies were caught on the latter two days, and particularly on the thirteenth.

REFERENCE CITED.

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NEW FORMS AND SPECIES OF THE GENUS CATASTICTA—IV.

By F. M. Brown, A. G. Gabriel, and F. W. Goodson.

Catasticta colla form **amba**, n. form.

Upperside: In many respects this form resembles *C. susiana* f. *plesseni* Roeber. On the forewings the dark basal area occupies about two-fifths of the inner margin. The limbal zone is uniformly about one-third the length of the inner margin in width. The limbal series is distinct and complete. The marginal series is present in the form of short light lines in the apical region. The nervules are rather heavily marked with dark scales. The basic light color is a tone of yellow buff, lighter than that on *colla* and darker and yellower than on *plesseni.*

On the hindwings the basal area occupies almost half of the cell. The limbal zone extends well into the end of the cell. The limbal and marginal series are complete, but indistinct. The spots of the limbal series are several times as large as those of the marginal series and are heavily suffused.

Underside: On this surface there is still more marked variation from *plesseni* with which this form might easily be confused. There is a slight but distinct yellowish cast over both wings. The nervules are sharply marked with dark brown scales. The limbal spots for the forewings are not crescent shaped.

On the hindwings the marginal series of triangles are straight sided not markedly incurved and the dark margins of these so extensive that in some specimens they almost obliterate the pearly submarginal series. In general the pattern on the underside is much richer than in *plesseni.*

Average length of the costa of the forewing: 26 mm. (23–27).

Type localities: All in southwestern Ecuador; Ambato, Zamora, Luja, San Francisco, Equito.

Repositories of the types:

The Holotype male: Ambato, Ecuador; British Museum, London, England.

The Paratype males 1–7; Zamora, Ecuador 3–4000 feet; Zoological Museum, Tring, England.

Paratype males 8–9; Ecuador; Zoological Museum, University of Berlin, Germany.

Paratype male 10; Loja, Ecuador: Paratype male 11; Rio Numbala, Ecuador: Paratype male 12; San Francisco, Ecuador: Paratype male 13; Rio Verde, Ecuador 5000 feet; 10–13 in British Museum, London, England.

Paratype male 14; Equito, Ecuador: Paratype male 15; no data; both in the Zoological Museum, Tring, England.

A MODIFICATION OF THE FEEDING REACTION OF AESCHNA.

By Cyril E. Abbott, Searcy, Ark.

Last summer a student brought into the laboratory the larva of some species of aeschnid dragonfly. It occurred to me that it might be interesting to discover what would happen to the insect with the labium removed. I therefore ligated the organ close to the head, and amputated the structure just distad of the ligation. The insect did not appear to suffer seriously from the operation, as it lived for about a month longer.

Of course without the extensible labium the insect could not capture prey, and at first it made no reaction even to food brought close to the head. After a few days it consumed food placed in the mandibles. A little later it moved toward the food offered, at first rather indifferently, but later with all the activity characteristic of the normal insect.

Suddenly it developed the habit of "leaping" on its prey: that is, upon seeing a moving object two or three centimeters away, it would first turn to face the object; then, by a forcible ejection of water from the brachial sack, it would move rapidly upon the object, at the same time "snapping" at it with the jaws. This maneuver, awkward as it was, occasionally resulted in a capture.

It would be interesting to experiment further with a number of specimens to disccover if such modifications in behavior are general, but unfortunately, at the time, I was unable to obtain other specimens. In any case such a striking alteration in behavior to meet a contingency which practically cannot occur to a specimen living under field conditions illustrates the remarkable flexibility in the behavior of an animal generally supposed to depend entirely upon reactions which are inherited, automatic, and fixed.

THE TIPULID PREY OF A CRABRONID.

By George E. Erikson, Amherst, Mass.*

While collecting in Palmer, Mass., on the morning of July 23, 1939, I was interested to see a wasp bear a large crane-fly to its nesting tunnel in an aspen log. Since I knew of no solitary wasp that preyed on tipulids, I captured the specimen, a crabronid, as it emerged from the tunnel. I split the log and found that the tunnel, apparently that of a cerambycid borer, was about 5 inches long, and of an oblong cross section measuring $\frac{3}{8}$ of an inch by $\frac{3}{4}$ of an inch. From the entrance on the side of the log, it entered obliquely in an axial plane to the depth of $1\frac{1}{4}$ inches and then followed a straight course parallel with the grain of the wood. The gallery has been tentatively identified as the work of *Saperda calcarata* (Say) by the Division of Forest Insects of the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

The gallery was filled for two-thirds of its length with tipulid flies, ten in number, five of each sex; and there was a single wasp egg lying free about one inch from the end of the tunnel. The legs of each tipulid had been amputated at the bases of the femora to permit the large flies to be taken through the small entrance of the nest. Dr. C. P. Alexander identified the tipulids as *Nephrotoma tenuis* (Loew).

In answer to my inquiry, Dr. Richard Dow informed me that there were no North American records of tipulids as prey of solitary wasps, and suggested that I publish a note on my find. He tentatively identified the crabronid as being either *Crabro maculipennis* F. Smith or *C. confertus* Fox. Miss Grace Sandhouse kindly compared the wasp with material in the National Museum and declared it to be the same as their material under *Crabro maculipennis*. According to Dr. Dow, tipulid flies have previously been recorded as the victims of five species of *Crabro* (s.l.), none of which preys exclusively on these Diptera. Four of these wasps are European and the fifth is a *Xenocrabro* found in Hawaii. The tipulids reported as prey represent at least fourteen species, including members of every tribe of tipulids except the small and unimportant tribe Lechriini of the Limoniinae.

Thus, this record of *Crabro maculipennis* F. Smith preying on *Nephrotoma tenuis* (Loew) is unique as the only North American record of a crabronid preying on tipulids and as the first record of the prey of this wasp.

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* Contribution from the Entomological Laboratory, Massachusetts State College.

THE MIGRATION OF A PIERID BUTTERFLY IN TEXAS.

By Harvey L. Sweetman, Massachusetts State College,
Amherst, Mass.

During a trip through southern Texas, while driving northward up the Nueces River valley, Mrs. Sweetman and I observed a flight of butterflies about five miles south of Montell and twenty-five miles north of Uvalde. The species has been identified as *Kricogonia lyside* (Godart) by Dr. Alexander B. Klots of The College of the City of New York. Two specimens, both females, have been deposited in the museum collection of Massachusetts State College at Amherst.

The flight was observed about 5:15 on the evening of May 30, 1939. The sky was partially overcast, with light air movement at the time. It seemed quite warm, but no facilities for measuring the temperature were available. Therefore weather data were secured from Mr. H. E. Carper of Uvalde and Mr. A. G. Beecroft of Montell, United States Weather Bureau cooperative observers, and Mr. D. C. Parman of the United States Bureau of Entomology and Plant Quarantine stationed in Uvalde. The data from Uvalde were most complete and are partially shown below:

Date	Temperature °F.				Relative humidity		
	Max.	Min.	5:00 P.M.	6:00 P.M.	Max.	Min.	5:00 P.M.
May 28	99	71	. .	89	. .	. .	. .
May 29	95	65	92	. .	95	32	48
May 30	93	65	93	. .	97	33	62
May 31	93	64	. .	77	. .	. .	. .

The relative humidity was rising at the time the migration was observed. The sky was partly cloudy to cloudy toward evening from May 28 to 31. Local showers were recorded for the county from May 28 to 31 and showers occurred in the morning at Montell on May 29 and at Uvalde in the morning hours on May 29 to 31. The barometric pressure was slowly falling from May 29 to 31. A light to moderate southeast wind was recorded for the region on these dates.

The migration was toward the southeast, with little wind at the time of observation. The pressure was falling, relative humidity was rising and relatively high, and the temperature was high. The migrants were travelling in a steady movement, being sufficiently numerous so that from one to twenty would be near one at any time. Most of the specimens were flying at a height of 3 to 10 feet above the ground. We collected specimens by standing and netting individuals that passed by. The flight was moving at almost right angles to the highway and was evident for a distance of 3 to 4 miles while driving.

The genus *Kricogonia,* according to Talbot (1935) contains one species only, *castalia,* but several forms including *lyside* are recognized. It is not certain that the North American *lyside* is conspecific with *castalia.* It is a neotropical species, being found in the United States in southern Florida and Texas and occasionally further north.

Williams (1930, 1939) cites two previous records of migration flights of *Kricogonia.* These were in Jamaica and Haiti in 1891 and 1926. Apparently this is the first flight to be recorded for the North American continent proper.

LITERATURE CITED.

Talbot, G. 1935. Lepidopterorum Catalogus, Pars. 66: 544–6, 645.

Williams, C. B. 1930. Migration of butterflies. Oliver & Boyd, Edinburgh. 473 pp. (Reference on page 133.)

1939. Some records of butterfly migration in America. Pro. Royal Ent. Soc. London, Series A, 14: 139–44.

To Subscribers.—It will be a great help to our Treasurer if the enclosed renewals are sent in promptly. Please note his new address—George P. Engelhardt, Treasurer, Eton Hall, Scarsdale, N. Y.

EDITORIAL.

The Perfect Description.

There is such a thing as a perfect description—but it is an ideal beyond any one man and as long as the ages. It would take a species from its very origin by the union of two cells, through its embryology, development, growth, mature life, reproduction and death, and even beyond death into the products of decay and their ultimate end. Every stage must be described, from cell to developed form, and every function of the organism. Its behavior and ecology must also be gone into in detail. This is the most bare outline of a complete description. The only living being for which a simulacrum of such a complete description has been attempted is Man. And in spite of the hundreds, the thousands, of works on him, the description is still far from complete. He still remains, in Dr. Carrel's phrase, "Man the Unknown."

At this point Thomas Didymus objects—we *do* have very complete descriptions of *Homo sapiens!*

This, unfortunately, is not so, by a very large margin. We have adequate descriptions for ordinary use of *sapiens* and his varieties. It is possible to recognize them quite accurately. And, after all, we have inside information in the matter, and in consequence, we have glimmerings of knowledge arrived at subjectively more often than objectively.

And how is this with insects? My witnesses are all entomologists of whatever rank—there is no such thing anywhere as a complete and perfect description of any one insect! At best, all that we have is a cataloguing of what are taken to be distinctive differential characters. Their validity depends on the extent of knowledge and on the judgment of the student. If he has neither, it is really too bad! J. R. T.–B.

BOOK NOTES

Fleas of Eastern United States, by Irving Fox; pp. i–vii + 1–191, plates I–XXXI, figs. 1–166. February, 1940. (Collegiate Press Inc., Ames, Iowa. $3.00.)

This book represents the results of over three years of study of the Siphonapteran fauna of the United States. Because of the material available to the author, it is confined to a consideration of the species reported from the East, fifty-five species being known to occur east of the one-hundredth meridian with the exclusion of Texas. The work is based on material in the National Museum and in certain other collections. Introductory paragraphs concern collection and preservation, morphology and terminology, and life history and control. In regard to collection, it is the reviewer's opinion that more specific information should have been given concerning methods of collection of hosts. Few entomologists are conversant with methods of field mammalogy, and while many of these are learned only by experience, more practical hints or references to literature would be quite helpful. The remarks on morphology and terminology of fleas, together with the first plate, are valuable in orienting the student. The book is concerned mainly with systematic treatment of fleas, and illustrations of taxonomic characters.

The order is divided into two suborders, following Oudemans. The *Integricipita* are represented by three families, easily recognized by Fox's keys. The two species of *Ctenocephalides* should be capable of easy diagnosis by key and illustrations, and this distinction is probably one of the commonest problems confronting students of fleas. The key to the genera of *Dolichopsyllidae* is workable, which is more than can be said for many other entomological keys. It is to be regretted that the author has not provided a key to the species of *Ceratophyllus.* However, the illustrations of genital characters compensate in part for this lack. The common genus, *Orchopeas,* is well treated, and Jordan's subspecies, *O. caedens durus,* is synonymized under *O. caedens.* The genus *Megabothris* is made to include *M. wagneri* and *M. vison,* previously placed by Jordan under *Monopsyllus.* These changes are made without comment. In the *Hystrichopsyllidae,* Fox has suppressed his own species, *Peromyscopsylla spinifrons* (1939) as a synonym of *P. hesperomys.* The drawing of the female genitalia of *Tamiophila grandis* does not represent the normal structure and Fox is not to be blamed for this fact, for it was owing to material at hand and not to faulty technique.

The treatment of individual species is adequate throughout the book. The nomenclature is tabulated under each species. There follows a description of each sex, usually from material personally studied, or lacking such material, published characters are recorded. Individual records are cited, and summaries of Eastern hosts and Eastern localities are given. Type material is designated. Following the taxonomic section, there is a synonymic index. This is succeeded by a useful and enlightening host index. The author has compiled a selected bibliography. The plates, occupying sixty pages, are a most important and useful feature of this book. They are original except in a few cases where material was lacking. Details of taxonomic value have been emphasized, and when used in conjunction with the text, these plates should enable the student to identify most of his material.

Fox's paper should serve several important purposes. It brings together in organized form information which was hitherto scattered among many publications of various authors. It calls attention to a group which is becoming of increasing importance from a medical and an economic standpoint. It should serve as an impetus to further productive work along this line. The book is attractively bound and well set up, and there are notably few typographical errors.—H. S. Fuller, Dept. of Comparative Pathology and Tropical Medicine, Harvard Medical School.

West Coast Crested Fleas, Corypsylla and Nearctopsylla (Three New Species). C. Andreson Hubbard. Pacific University Bulletin, Vol. 37, No. 1, March 1940. 12 pages.

American Mole and Shrew Fleas (A New Genus and Three New Species). C. Andreson Hubbard. Pacific University Bulletin, Vol. 37, No. 2, April 1940. 12 pages.

West Coast Catallagias (Three New Species). C. Andreson Hubbard. Pacific University Bulletin, Vol. 37, No. 3, May 1940. 4 pages.

In the first paper, the author describes *Nearctopsylla jordani* off moles from Oregon, *Corypsylla jordani* off *Neurotrichus gibbsi,* and *C. kohlsi* off *Sorex obscurus bairdi,* also from Oregon. Comparative illustrations of these two genera of fleas are given, and differences are discussed. In the second paper, a new genus, *Corypsylloides,* is erected for *C. kohlsi. Doratopsylla jellisoni, Epitedia jordani,* and *E. stewarti* are described as new species. The author discusses the recorded occurrences of fleas on Insectivora, and a useful index of American mole and shrew fleas is provided. In the third paper, Hubbard describes and figures three new species of *Catallagia* from Oregon, *C. sculleni, C. chamberlini,* and *C. motei,* all off small rodents. *C. charlottensis* Baker and *C. decipiens* Rothschild are figured and redescribed.

The author plans to make the fleas known to himself generally available by depositing collections of them in certain museums in the United States and elsewhere. There are twenty-two of these depositories, as listed in the first paper. Dr. Hubbard is to be complimented for this generous gesture, which will be appreciated greatly by students of fleas.

EXCHANGES

This one page is intended only for wants and exchanges, not for advertisements of articles for sale. Notices not exceeding THREE lines free to subscribers. Over lines charged for at 15 cents per line per insertion.

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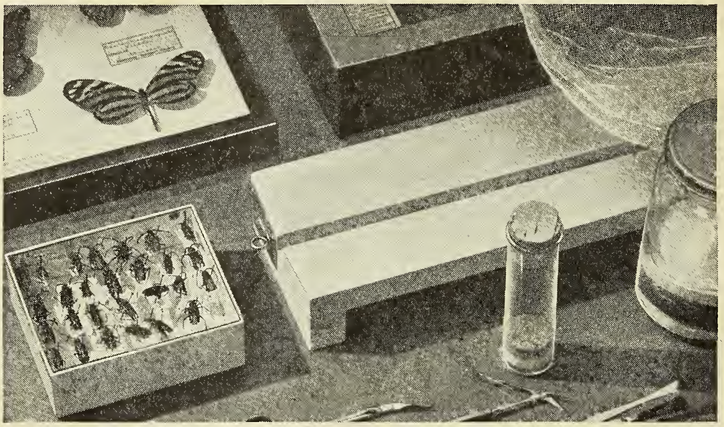

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